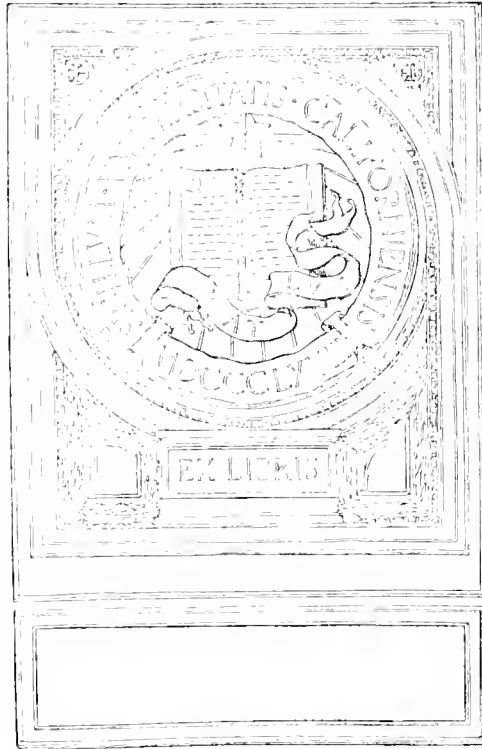




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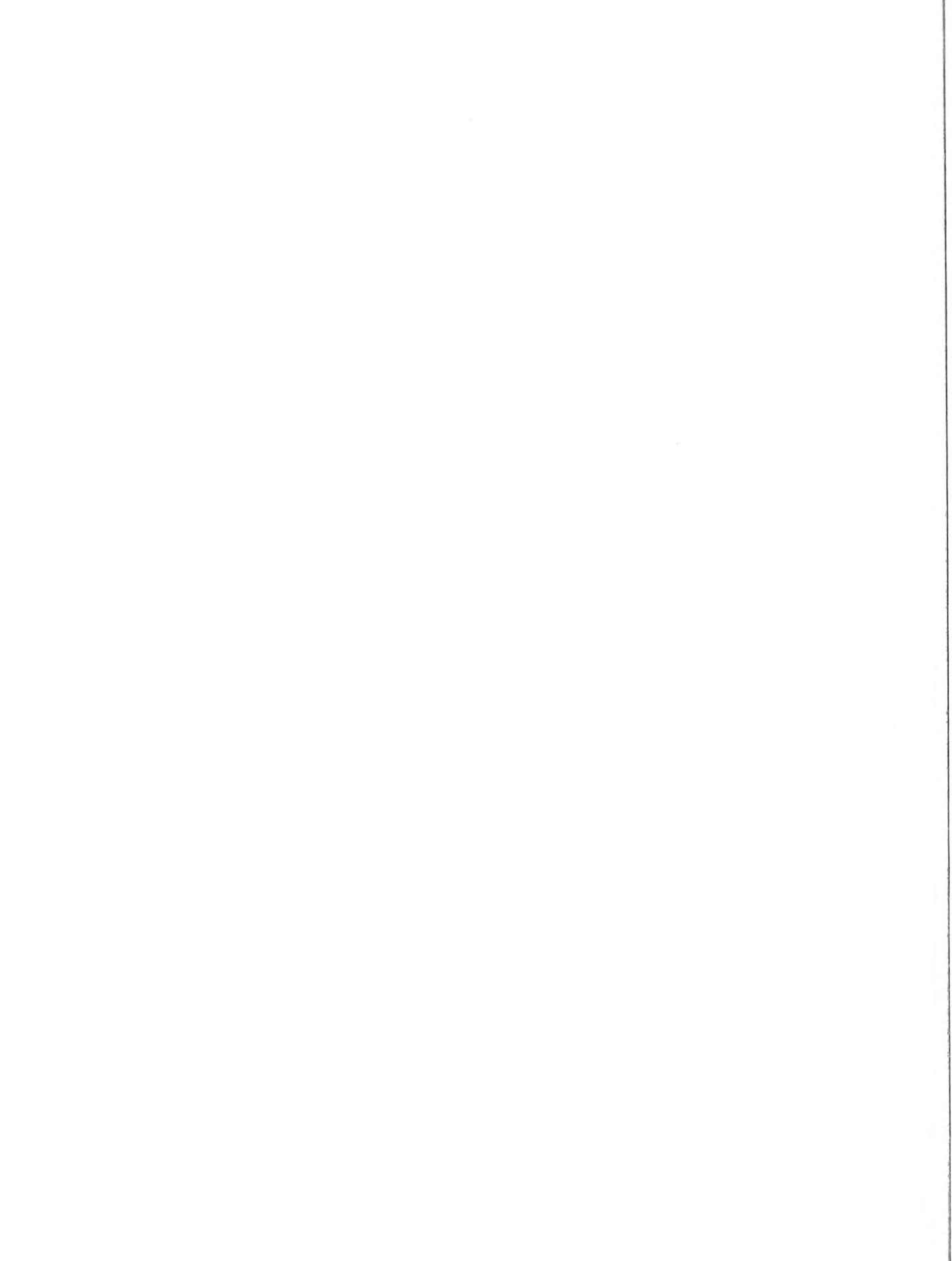












THE  
CYCLOPÆDIA;

OR,

UNIVERSAL DICTIONARY

OF

Arts, Sciences, and Literature.

BY

ABRAHAM REES, D.D. F.R.S. F.L.S. *S. Amer. Soc.*

WITH THE ASSISTANCE OF

EMINENT PROFESSIONAL GENTLEMEN.

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# CYCLOPÆDIA:

OR, A NEW

# UNIVERSAL DICTIONARY

OF

ARTS and SCIENCES.

## GENERATION.

**G**ENERATION is that function of the animal economy by which the species is perpetuated. Inanimate matter and unorganized bodies are subject to no alterations, and would never change their condition, did not external forces destroy or modify them. On the contrary, organized bodies, very different from these inert masses, are active media of new combinations and changes; they undergo alterations, and are even destroyed by the exercise of their own powers, the entire cessation of which delivers up their spoils to the grand circle of changes, which organized matter is constantly undergoing. Although some of these bodies may last for a century, while the greater number live only for a few years, days, or even hours, this unequal duration, these moments or ages of existence, are nothing with respect to nature, and the death which she allots to man, to the plant or the insect, is not the less necessary and certain. But, if individuals are sacrificed and perish, the species survive and are immortal; by a constant and general law, animated bodies never die altogether, but are renewed and perpetuated by various modes of re-production. Some terminate their vital course while others are beginning it; and never, says Lucretius, does morning or night visit the globe, without having funeral lamentations round a bier, and the plaintive cries of an infant in the cradle. There is a constant alternation of deaths and births, of losses and reparations; and the torch of life is rapidly transmitted in the series of succeeding generations; "quasi currentes vitæ lampada tradunt." At a certain point of elevation in the scale of animal existence, this object is accomplished by a double series of organs, executing very different functions; and re-production is effected by a true process of generation, under the influence of that physical feeling, the Venus, whose univer-

sal empire and irresistible attractions are so beautifully delineated by the Roman poet.

Æneadum genetrix, hominum divumque voluptas,  
Alma Venus! cæli subter labentia signa  
Quæ mare navigerum, quæ terras frugiferentis  
Concelebras; per Te quoniam genus omne animantum  
Concipitur, visitque exortum lumina solis:  
Te, Dea, te fugiunt venti, te nubila cæli,  
Adventumque tuum: tibi suaves dædala tellus  
Submittit flores; tibi rident æquora ponti,  
Placatumque nitet diffuso lumine cælum.  
Nam, simul ac species patefacta est verna diei,  
Et referata viget genitabilis aura Favonii;  
Aëriæ primum voluere, te, Diva, tuumque  
Significant initum, percussæ corda tuâ vi.  
Inde feræ pecudes persaltant pabula læta,  
Et rapidos trahunt amnes; ita, capta lepore,  
Illecebrisque tuis omnis natura animantum  
Te sequitur cupide, quo quamque inducere pergis.  
Denique, per maria, ac montes, fluviosque rapaces,  
Frondiferaque domos avium, camposque virentes,  
Omnibus incutiens blandum per pectora morem,  
Efficis, ut cupide generatim secla propagent.

Generation is the greatest mystery presented to our view in the economy of living bodies; and its real nature is still involved in the most complete obscurity. Hitherto no observation authorizes us to admit the simultaneous formation of a living body in all its parts; that is to say, by the union of particles suddenly brought together. The comparison of generation with crystallization is supported by no just analogy: crystals are made up of homogeneous particles, attracting each other indistinctly, and agglutinated by their

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faces, which determine the order of arrangement; while living bodies are composed of numerous fibres or plates, heterogeneous in their composition, diversified in their configurations, and destined to particular situations, so that they can only be in one place, and between other determined fibres or lamellae. Moreover, living bodies, however small they may be, possess all their parts from the first moment of their existence; they grow, not by the addition of new layers, but by the sometimes uniform, and sometimes irregular development of parts, all of which existed previously to any sensible growth. The only circumstance belonging to all kinds of generation, and consequently the only essential circumstance in the process is, that every living body, at the first periods of its sensible existence, is attached to a larger body, of the same species with itself, that it makes a part of this larger body, and is nourished by its juices for a certain length of time. Its subsequent separation constitutes its *birth*; which may be produced simply from the life of the larger body, and the consequent development of the smaller, without the aid of any occasional cause. Thus, in its essence, *generation*, as far as we can understand it, is only the appearance of a small organized body upon or in some part of another and larger one, from which it will be separated, at the expiration of a certain period, in order to assume an independent and isolated existence. All the acts or organs, which co-operate in the process, in a certain class of organized bodies, are only accessory to this primary function. When the function is thus reduced to its most simple state, it constitutes the *gemmiparous*, or generation by shoots. In this way buds are formed on trees, and developed into branches, which will form future trees, by means of slips or cuttings. The polype (hydra) and the sea anemone (actinia) multiply in this manner; some worms are propagated by a division of their body, and must therefore be arranged in the same division. This mode of generation requires no distinction of sex, no copulation, nor any particular organ. Other modes of generation are accomplished in appropriate organs: the germs appear in a definite situation of the body, and the assistance of certain operations is required for their further development. These operations constitute *fecundation*, and suppose the existence of sexual parts; which may either be separate or united in the same individual. The fecundated or fecundable sex, in which the germ is found, is the female; and the fecundating sex, the assistance of which is necessary for the complete development of the germ, is the male. The office of the latter is that of furnishing the fecundating or femal fluid: but the manner in which that contributes to the development of the germ, is not yet settled by physiologists. Some, forming their opinions from the human subject and the mammalia, where the germs are imperceptible before fecundation, suppose that these are created by the mixture of the male fluid, with that which they suppose to exist in the female; or that they pre-exist in the male semen, and that the female only furnishes them with an abode. Others consult the analogy of the other classes of animals, and of plants. In several instances, particularly in the frog, the germ may be clearly recognized in the ovum of the female before fecundation: its pre-existence may be inferred, in other cases, from the manner in which it is organically connected to the ovum, when it is first visible. For it is agreed on all sides, that the ovum exists in the female before fecundation, since virgin hens lay eggs, &c. From this analogy, these physiologists conclude, that the germ pre-exists in all females; and that the fecundating liquor is a stimulus which bestows on it an independent life, by awakening it, in a manner, from the species of lethargy, in which it would have otherwise constantly remained.

The origin of the germs, and the mode of their existence in the female; whether they are originally formed in all their parts in each individual by any vital process, or are all pre-existent, being included in each other, or whether they are diffused through the body, and require a concurrence of circumstances to bring them into a situation favourable for their development, are questions, which it is utterly impossible for us to decide in the present state of our knowledge. These points have for a long time been agitated by physiologists; but the discussion seems now to be abandoned by universal consent.

The combination of the sexes, and the mode of fecundation, are subject to great variety. In some instances, the two sexes are united in the same individual, and fecundation is accomplished without any extraneous aid; such are the hermaphrodite and monoicous plants, the acephalous mollusca, and the echinodermatous animals. In others, each individual possesses both sexes, but requires the assistance of another, which it fecundates, and by which it is fecundated. This is the case with the gasteropodous mollusca, and with several worms. There are distinct individuals, male and female, in other classes; as, for instance, in the dioicous plants, in all animals, which have a vertebral column, in the cephalopodous and some gasteropodous mollusca, in some worms, in the crustacea, and in insects; in short, in the far largest portion of the animal kingdom.

*Fecundation* is accomplished in plants by means of a liquor contained in small capsules, which resemble a fine powder in appearance, lodge on the female organs, and, burbling, deposit their contents. In animals, the liquor is always applied immediately upon or about the germs; and in many cases it is not brought in contact with the ova, until they have been laid, as in the bony and oviparous fishes, and the cephalopodous mollusca: here the males and females have no commerce. Sometimes, as in the frog and toad, copulation is necessary in order to determine the discharge of the ova and semen, but fecundation is still performed out of the body. Lastly, in the great majority of instances, the femal liquor, introduced by the male into the body of the female, fecundates the ova before they are laid. This is the case in the mammalia, birds, most reptiles, and some fishes, in the hermaphrodite gasteropodous mollusca, in the crustacea and insects. The union of the two sexes, or the act by which this is accomplished, is called *copulation*. In all the last-mentioned orders ova may be discharged without previous copulation, as in the preceding ones. But they receive no further development; nor can they be fecundated when thus voided. The effect of a single copulation varies in its degree; it usually fecundates one generation only, and produces one pregnancy; but sometimes, as in poultry, several eggs are fecundated, and afterwards discharged successively: still, however, they only form one generation. In a very few instances, one act of copulation fecundates several generations, which can propagate their species without the aid of the male. In the plant-louse (aphis) the species has been continued through eight generations from one copulation; and in some monoculi, through twelve or fifteen.

When the germ is detached from the ovary, its means of existence may be more or less complete. In most animals it is accompanied by an organized mass, to which it is connected by means of vessels. The absorption of this serves for its nutrition and development, until the period of its independent existence. It derives nothing therefore from the body of the mother, from which it is separated by coverings, varying in number and solidity. The germ, together with its mass of nourishment, and the surrounding membranes, constitutes an egg, or *ovum*; and the animals, which produce their young

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young in this state, are denominated *oviparous*. In most of these the germs contained in the egg is not developed, or hatched, until that part has quitted the body of the mother, or has been *laid*; whether it be necessary that it should be afterwards fecundated, as in many fishes, or that it requires only the application of artificial heat for its incubation, as in birds; or that the natural heat of the climate is sufficient, as in reptiles, insects, &c. These are strictly *oviparous* animals.

The ovum, after being fecundated, and detached from the ovarium, remains in some animals within the body of the mother, until the contained germ be developed and hatched. These are *false viviparous* animals, or *ovo-viviparous*. The viper and some fishes afford instances of this process.

The mammalia alone are truly viviparous animals. Their germ possesses no provision of nourishment, but grows by what it derives from the juices of the mother. For this purpose it is attached to the internal surface of the uterus, and sometimes by accident to other parts, by a kind of root, or infinite ramification of vessels, called a *placenta*. It is not therefore completely separated from the mother by its coverings: and it does not come into the world until it can enjoy an independent organic existence. The mammalia cannot therefore be said to possess an ovum, in the sense which we have assigned to that term.

According to this sketch of the subject, generation may be said to consist of four functions, differing in their importance, and in the number of animals, to which they belong, *viz*: 1st. The *production of the germ*, which is a constant circumstance: 2dly. *Fecundation*, which belongs only to those instances where there is a distinction of sexes: 3dly. *Copulation*, which is confined to those kinds of sexual generation in which fecundation is accomplished within the body: lastly, *Utero-gestation*, which belongs exclusively to viviparous generation. The generative organs may be most naturally arranged according to this distribution of the partial functions, which they execute. The simple production of a germ, or gemmiparous generation, may be accomplished at any point of the body, and has, therefore, no peculiar organ. Sexual generation demands an organ for the production of germs, and another for that of the fecundating liquor. Modes of union are necessary when copulation takes place: and gestation requires a receptacle adapted to the abode of the fœtus. Thus we have preparatory and preserving organs; instruments of copulation; and organs of education. Those of the two first classes are divided into male and female; the last belong to the latter sex only. The preparatory and preserving organs of the males secrete the semen, and the other fluids which are to be mingled with it, and retain these secretions. They consist, in their most complicated form, 1st. Of the *testicles*, which prepare the seminal fluid, and conduct it, either into a particular reservoir, or into a canal, from which it is conveyed out of the body, or into a cloaca, from which it is in like manner ejected: 2dly. Of the *vesiculae seminales*, supposed to be reservoirs for the semen: 3dly. Of the *prostate glands*; and, 4thly. Of *Cowper's glands*, which separate a peculiar fluid, mixed with the semen at the time of coition. The testicles are absent in the last classes only of the animal kingdom, where generation is performed by a simple division of the animal, or by shoots. They exist in all the classes of vertebral animal; and, of the invertebral division, in the mollusca, crustacea, insects, and most vermes. Their number, structure, &c. differ very much in these various classes. The vesiculae, prostates, and Cowper's glands, being less essential in their functions, are much less generally found, and are chiefly confined to the first classes of the animal kingdom. The preparatory female organs serve the purpose of developing and preserving the

germs. Their existence is as general as that of the parts just mentioned; but they are much more simple in the first class of the animal kingdom. They consist of two bodies similar in form, size, and structure, and named by modern physiologists *ovaria*, in order to express more accurately, than by their old name of testes, the function to which they are destined. In fact, if their structure, considered simply in man, and most of the mammalia, leave any doubt concerning their office, its nature is so evident in the other classes, that their function cannot fail to be recognized. In all the classes which succeed the mammalia, the ovary or ovaries serve evidently for the production and preservation of the germs or ova, which are formed in these bodies previously to the approaches of the male. Analogy leads us to conclude that the same circumstance holds good in the mammalia; and this conclusion is one of the most important results from the study of comparative anatomy and physiology.

The organs of copulation, in the male sex, consist of one or more projecting bodies, called penes, generally perforated by a canal, named the urethra, capable of being introduced into the female organs, in order to convey to them the fecundating liquor, or for the simple purpose of producing an irritation necessary for conception: or they are supernumerary members, enabling the male to grasp and hold the female. In the latter sex, the copulating organs consist of canals, particularly designed to receive the male penis, or give passage to the products of conception: or of cavities, which serve also for other purposes, but which, at the time of copulation, receive the penis, and transmit the fecundating liquor to the educating organs.

The educating organs receive the germ or ovum, after its detachment from the ovarium, retain it for a greater or less length of time, contribute in a more or less direct manner to its growth, and convey it out of the body: or they furnish nourishment to the young, when born, or afford it a temporary lodging. They are, therefore, divided into external and internal parts. The latter may be again distinguished into two kinds. The first of these are simple canals, through which the germ or ovum is to pass, either in order to be conveyed out of the body (as in the egg), or to be transmitted into the parts of the second description. The latter are very dilatable bags, to the parietes of which the germ is attached by means of vessels conveying the materials of its nutrition, and preserving it in this way until it has acquired a certain degree of growth. Organs of the first kind are formed in the four classes of vertebral animals; and are called *Fallopian tubes* in the mammalia, *oviducts* in the birds, reptiles, and fishes. Parts of the latter description belong to the mammalia only, and are the *uterus*. The external educating organs are, in the mammalia, the mammary glands secreting the milk by which the young are nourished; or receptacles, in which they are retained for a time, in a few genera. One kind of reptiles only possess analogous pouches.

To fill up the outline which we have presented to our readers in the preceding sketch, would require a detailed description of organs varying almost infinitely in form and structure in the different classes of organized bodies. These details will be found in the proper articles of the Cyclopædia, relating to vegetable and comparative anatomy: this general view has been thought necessary, as introductory and explanatory. The remainder of this article will be devoted to the anatomy and physiology of the generative organs in the human subject. The growth and development of the ovum in the uterus has been considered under the article EMBRYO, and the anatomy of the mammary gland will be found under BREAST.

The preceding account will shew what various methods are employed by nature for the perpetuation of the races of  
B 2 organs

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organized beings; this seems to have been a very leading object, and one accordingly, in which she has developed all the fertility of her resources. Scarcely can such diversified phenomena be reduced, by artificial classifications, to any common and constant laws: new facts speedily modify or overturn the previous generalizations; and imagination can scarcely conceive any possible forms of propagation which observation does not soon realize. The generative functions should be particularly attended to by those who are employed in delineating the manners of animals. They will probably find that the propensities and habits of each are intimately connected with the mode of propagation; and that the character of its wants, pleasures, and labours, its sociability and perfectibility, and the extent or importance of its relations either to other species or to the various external bodies or agents, particularly depend on the circumstances or conditions to which its reproduction is subjected, and on the disposition of the organs employed for this purpose. This is certainly very much the case with man, which is the object of our present investigation.

Man belongs to one of those classes of the more complicated and perfect animals, where propagation is effected by the concurrence of two beings, whose organization, possessing most circumstances in common, is distinguished by certain particular traits. He quits the womb of his mother with organs capable of resisting the impressions of the atmosphere, and of assimilating food to his own substance: he can already live by his own independent powers. He is not destined to remain, like the oviparous animal, included in a foreign envelop, and to continue for an indeterminate length of time in a state of inaction which hardly differs from non-existence: he does not wait until creative warmth bestows on him motion and life, amid the nutritive fluids prepared beforehand by nature, like those in which the embryo of the serpent, the tortoise, or the bird swims for a long time as an invisible point. The human fœtus has been supported in the uterus by fluids animalized in the vessels of the mother: it subsists, immediately after birth, on milk, prepared in organs set apart for that office. The duration of gestation, that of infancy, during which the aid of the parents is indispensable, and the epoch of puberty, or the moment at which the generative faculty is manifested by sensible signs, differ greatly in the different species of animals; these circumstances are not connected together by uniform or constant relations.

Man, like all the more perfect animals, is not born with the power of reproducing the species. The organs, which are at a future period to exercise this function, are now completely inactive, and the appetites which solicit their action do not exist. The time of puberty;—the epocha at which the frame and powers of the being receive their full development, is also the period at which the generative organs, recovered from their lethargy, assume an active state, and become capable of exercising their functions. The duration of infancy is longer, and the age of puberty is later in man than in any animals; although the term of gestation is shorter than in some other species. These circumstances must have a very marked influence on the wants, the faculties, and the habits of the human race.

The characters of the generative functions partake of those which belong to the animal and organic lives. Thus, on one side, all that precedes the union of the sexes, all the impressions made on one by the charms which nature has bestowed on the other, belong to the senses; this very union is an act of the external life, to which animals are impelled by instinct, over which reason presides to a certain degree in man. The influence of habit is also perceived here; but instead of blunting the enjoyment, it renders it rather more acute, and often gives rise to factitious wants. On the

other hand, the secretion of the fluid, by the emission of which man contributes to the reproductive process, the mysterious work of conception, the development of the new being, &c. all belong to the organic life.

*Sexual Distinctions.*—Some ancient philosophers have held on this subject opinions very injurious to the fair sex, and indeed for manifestly whimsical and ridiculous, that a simple statement of them will shew their absurdity. Woman, in the opinion of Aristotle, is an imperfect man, an ill-formed and imbecile individual; while man is characterized by the attributes of strength and power. Galen goes even further, and confounding the sexes in those very parts, where their distinguishing characters are the most unequivocally marked, admits no other differences between the male and female generative organs than such as may be deduced from development and situation. He does not regard even the addition of the uterus in the female as an objection to this opinion, but, bending nature to his hypothesis, he represents this organ as being turned inside outwards in man to envelope the glands in which the seminal fluid is elaborated. This strange paradox has been adopted by numerous writers, and is hardly yet completely abandoned. Daubenton calls the clitoris a penis in miniature; Buffon turns the ovaries into testicles, and endeavours to prove that the addition of the uterus alone constitutes any essential distinction between the male and female parts.

Some resemblance in the unimportant points of form and arrangement gave rise to these unfounded analogies: pride and sexual prejudices, joined to the results of superficial observation, seem to have so far misled true philosophers, whose strange opinions we have just alluded to, as to make them discover, in one of the first productions of nature, a feeble sketch, and a timid production. Woman has appeared to them as a degradation and imperfect copy of the constitution of man, while, in fact, she is the most essential part of the species, as contributing by far the greatest share to the business of reproduction. A more accurate examination will destroy these supposed analogies, and prove that man and woman do not differ in the relations of more or less, but that the structure and functions of their generative organs are different in their kind; that their whole constitution has in each its peculiar type, the distinctive traits of which offer to our view a long chain of physical and moral effects more or less immediately dependent on the functions of the organs concerned in the business of generation.

The characters of sex do not therefore shew themselves in any single point; it is not merely a particular organic apparatus, nor those external forms which delight us, that constitute woman: and if she is principally characterized in some parts, where the sexual physiognomy is the most decidedly expressed, if the superficial traits, and the sweetly rounded contours, which constitute her charms, form her most agreeable distinction, she is woman in the eyes of the naturalist and physician, in all her modes of existence, in her moral affections as well as in her physical system, in her enjoyments and pains; in a word, all parts of her existence bear the character of sex, and present a series of contrasts and oppositions with the corresponding points in man.

It is however only at the epocha of puberty, at that period of life called by Buffon "le printemps de la nature, la saison des plaisirs," that the assemblage of all the sexual traits is exhibited to our observation; and that man and woman, attracted to each other the more forcibly in proportion as they differ, become connected by various relations, which enlarge an existence hitherto personal, solitary and isolated. Woman may be distinguished from man by general and particular differences: the latter are so decided as to be easily discernible at all times, while the former, which are our present object



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ject, are not always equally remarkable, and at one time cannot be distinctly traced. In the first years of life, the individuals of the two sexes do not differ from each other at the first view; they have nearly the same general air, the same delicacy of organization, the same gait, and the same voice. Experiencing the same wants, exercising the same functions, and often partaking together of the same infantile sports, they excite in the mind of the spectator who watches them with pleasure, no ideas of distinguishing characters; they both appear to him only as awakening that tender emotion which we always feel at the contemplation of innocence joined to weakness. Indifferent and isolated, each as yet lives only for himself; their existence, purely individual and independent, exhibits hitherto none of the relations which constitute in the sequel a source of mutual dependence. However, this equivocal state does not last long: man speedily assumes the features and character which mark his destination; his limbs lose the softness and the gentle forms which he partook with the female; the muscles, the chief instruments of animal force, condense, by their reiterated contractions, which are consequent on more violent and long continued exercise, the cellular substance, which filled their interstices and gave a roundness to their form; hence they become more prominent, and give to the limbs more rough and decided outlines. It is no longer the same individual: the deeper tint of the countenance, the increased depth and strength of the tone of voice announce an access of vigour necessary for the purposes of his future character. The timidity of infancy has given way to an instinct which makes him despise danger; he fears nothing, because the impetuous current of his blood makes him disregard all obstacles. His superior stature, his determined gait, his new tastes and ideas all conspire to mark in him the image of strength, and to give the characters of that sex which is to protect the other.

Woman, in advancing towards the age of puberty, departs from her primitive constitution less sensibly than man. Delicate and tender, she even retains something of the temperament belonging to children. The texture of her organs does not lose all its original softness. The development, produced by age in all the parts of her body, never bestows on them the same degree of consistence which they acquire in man: yet, in proportion as the traits of the female are fixed, her figure, form and proportions exhibit differences, some of which did not exist before, while others were scarcely sensible. Although she sets off from the same point as man, she is developed in a manner peculiar to herself, and arrives sooner at the term of her development. Every where puberty arrives earlier in the female than in the male sex. Has nature a greater task to perform in the latter than in the former? Does it cost her greater efforts to bring man to perfection than woman? Or does the ease which characterizes female motions and actions exhibit itself already in the first developments of her physical constitution? Perhaps nature terminates her work the sooner for the female organs being of less volume than the male, as her operations are conducted within a more limited sphere. However we may explain it, man is still subject to the laws which govern him in infancy, while woman experiences already a new mode of existence, and finds herself, perhaps with astonishment, provided with new attributes and subject to a class of functions not observed in man, and hitherto unknown to herself. From this instant there is unfolded in her a new chain of physical and moral relations, on which depends that new and attractive interest with which she inspires man, and which has already become a source of new wants and affections.

In running through a more detailed sketch of the differences observable in the two sexes, we find them differing in the first place in stature, and in the size and proportions of parts. The height is less in the female, by about one-sixth. The middle of the body in man is at the separation of the lower limbs at the pubes: in woman it is higher, and hence the lower limbs are shorter, while the lumbar region is longer. This gives to the female sex in general, and to the Americans and Negresses in particular, that elegant slenderness which distinguishes them. The arm or leg of a woman could be immediately distinguished from those of a man: the form of these parts is much more delicate, and less marked by decided prominences. The bust is not so broad, but more rounded, and particularly distinguished by the size and elegant formation of the breast, which is commonly but little developed in man, where its greater development would be regarded as a deformity. The thighs are much larger, more rounded, and further apart; they approach each other below, so that the knees are slightly turned in. The latter circumstance is seen in the Venus, and the whole formation of these parts is attended with advantages in gestation and parturition, although the peculiarity in question is not seen in those females which in common opinion are the best formed. The convexities described by the lower limbs at their upper part, and uniting them by such happily rounded forms with the trunk, have a very obvious peculiarity of character in the softer sex. They are more prominent, and approach in their contour more to the hemispherical form. All other parts of the lower limbs are distinguished by their softly rounded outlines. The foot is smaller, and the base of support for the body is proportionally narrow. The leg gradually diminishes from above downwards, instead of swelling out abruptly at the calf. The outlines of the upper limbs are equally flowing and soft; thus the arm of woman is fatter and more rounded; the whole upper extremity corresponds in its comparative shortness and smallness to the general difference in stature; and is terminated by a small hand, and short, delicate and flexible fingers.

We may observe further that the head is smaller, the face shorter, and the neck longer in woman. The chest is not so long, but deeper; the abdomen more prominent and rounded; the shoulders are carried more backwards, and stand out less from the trunk. Hence the breadth of this part is much less considerable than in man, where the shoulders are more fully developed and more widely set off, and constitute, in their comparatively greater size, a very impressive feature of the superior strength, which is the attribute of the male sex. In the female trunk, on the contrary, the broadest part is below: the pelvis, holding the organs of generation, being principally concerned in the functions of utero-gestation and parturition, being, in short, the seat of those attributes which especially distinguish the female, is much more capacious than in the male. Hence the superior breadth of the female hips: hence the opposite characters of the trunk in the two sexes, in respect to size. The trunk of the female is a pyramid, with the broadest part below; that of the male is just the reverse. Camper has shown, that if the body of a well-formed man be delineated on an elliptical area, the shoulders pass out of the ellipse, while the pelvis falls within it; on the contrary, that the hips exceed and the shoulders fall within the line in woman. (*Mémoire sur le beau Physique*). In those specimens of ancient art, which may be regarded as models of the most characteristic formation, the difference of breadth in these parts amounts to one-third: the shoulders being so much broader in the male, and the hips in the female. The greater breadth of the pelvis gives a broader  
base

base of support to the female trunk; and, as it throws the thigh-bones further apart at their upper ends, produces the increased wideness of the hips. Hence in progression the centre of gravity is more sensibly changed at each step; and there is a perceptible rolling of the pelvis, which characterizes the female gait. The inconvenience of this arrangement counterbalances the advantages which the broader base of support might otherwise have bestowed on the female organization; and the latter is, in truth, an imaginary superiority, since the feet, which are always small in women, offer ultimately a narrow surface for the body to rest on.

The various pieces of the skeleton, by their respective disposition and junctions, determine the essential form of the body, its position and attitudes, and the extent and variety of its motions. The characters of the general form, which we have already considered, are therefore to be retraced in the bones; and in this point of view a parallel of the male and female organization leads to very important results. It is difficult to meet with a well-formed female skeleton, where the structure can exhibit or recall the leading traits of the female form. After much trouble and observation, Soemmerring met with a specimen of what he considered the best and most natural form in a young girl of Mentz, whose form had not been impaired by absurd modes of dressing, and who had been successfully delivered a short time before her death. A beautiful plate of this skeleton, with its description, is exhibited in his "*Tabula sceleti feminini, junctâ descriptione.*" folio, 1797. The female skeleton, on the whole, is smaller in all its dimensions, and more slender than the male. The individual bones have fewer inequalities, their prominences are less strongly marked, the grooves or impressions more superficial, all the cavities less deeply hollowed out: hence the surface seems more finely turned, and is distinguished by its smoothness. They are often actually softer, and have on the whole a peculiarly feminine character, which cannot be easily conveyed in description. The head, with the teeth, bears a greater ratio to the weight of the skeleton, on account of the individual bones being in general more slender: the proportions are 1:6 in the female, 1:8 or 1:10 in the male. The cranium is larger in proportion to the face. The thorax is shorter, more convex in front, and more distant from the pelvis, the space between the last rib and the crista ili being greater. It is less prominent in front; so that while this part projects the furthest in the erect or supine position of the male, the symphysis pubis does the same in the female. The loins are longer, and the angle between them and the sacrum more acute. The disposition of the pelvis is particularly characteristic, as being so immediately connected with the sexual functions. It is larger in all its dimensions. The sacrum is turned more backwards, is broader, and more concave; the *ossa coccygis*, more moveable and slender, project less into the cavity of the pelvis. The hip-bones (*ossa innominata*) are broader, smoother, and expanded further in the lateral direction: hence their crista and tuberosities are more distant, hence the space between the *ossa pubis* is greater. The angle formed between the ramus and symphysis pubis is larger: that between the two bones of the pubes is acute in man, while it is of 80 or 90 degrees in woman; and approaches more nearly to the form of an arch. That the sexual functions are favoured by all these circumstances is very evident; but the advocates of linal causes point out more particularly the reason for the wider space under the *ossa pubis*: "*Ad virum admittenda intercræpine majore crurum inferiorum ossium pubis.*" (Albinus de sceleto, p. 475.) The tuberosities of the ischia are more distant, larger and smoother. The clavicles are less curved, and the shoulder joints are less dif-

tant. The acetabula are further apart, and the thigh-bones more oblique in their position: the latter are also more curved forwards, and have longer internal condyles.

The muscles of the female are more slender and delicate, they are, in fact, less dense, softer and moister. These organs are less prominent, and their swellings, partaking of the general softness of the female constitution, have not that character of vigour which their rough prominences and strongly marked interstices impress on the frame of a muscular man, in whom the exterior traits of sex have not been destroyed by effeminate manners or sedentary habits. The cellular and adipous tissue is more abundant in the female; and this, joined to the smaller prominence of the muscular bellies, gives to the limbs that soft roundness and delicate contour which characterize female beauty, as expressed in the most celebrated productions of great artists.

The differences just described, the comparative weakness of the muscles, the elegance and beauty of the external forms, belong to the very nature of woman. Education and habits may add to these characters; may increase the delicacy of organization; but their influence is not sufficiently powerful to induce us to overlook the existence of a radical innate difference in the physical structure of the sexes, occurring in all ages and amongst every people. That such differences of organization will produce corresponding varieties of function may be readily allowed; but our facts are not quite so indisputable on this point. We could undoubtedly point out many peculiarities in the sensibility of women, taking the term in its most extensive sense, in their perceptions, their mental operations, and the reactions of the nervous system on the rest of the frame. We could trace many circumstances to the influence of the generative organs, and particularly of the uterus. But the influence of education, habits and customs, is so extensive, that it is difficult to distinguish between the results of these causes, and of the supposed original distinctions in organization. The reader may refer on this subject to the *Histoire naturelle de la Femme*, by Moreau, tome 1, p. 112, &c.

We cannot draw any very strong line of distinction between the sexes in the vital and natural functions. We may apply, indeed, to this subject, the philosophical remark of Buffon concerning animals; viz. that they differ from each other more strikingly in proportion as we compare them together in superficial points, which do not affect the nature of their existence so much as its exterior development. Yet the characters of sex are so deeply impressed, that we find traces of them even in these functions, when submitted to a rigorous examination. The pulse, *ceteris paribus*, is more frequent; the lungs are smaller, and the chest narrower. The appetite is less; the body grows more rapidly, and the periods of dentition, puberty, and adult stature are more early. See, for more detailed observation on this head, the work above quoted.

The voice is marked by very characteristic distinctions in the two sexes. In man it is strong, deep, less soft and flexible. In the female it is sharper, and the organs are more flexible, so that articulation can be performed more rapidly. It has also a peculiar quality or tone, which, in many instances, constitutes an inexpressibly attractive charm. "Of all acute voices," says Rousseau, "it must be allowed, in spite of the prejudices entertained by the Italians in favour of the castrato, that none are equal to those of women, either in the extent or beauty of the tone." The anatomist, perhaps, will attempt to explain these circumstances by observing, that the glottis is not enlarged at the age of puberty in females, as it is in males; that the larynx is considerably smaller; that the tongue, the muscles, and the organs of speech being

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less rigid, like all the other parts of the female, young girls ought to speak sooner than boys, &c. Among the several distinctions belonging to this head, we must notice the greater prominence of the thyroid cartilage in the male.

The texture of the skin is more dense and compact in men, whiter and more expanded in women. In brunettes, particularly, it has a softness and polish, which convey the most voluptuous impressions to the organs of touch. "Persons," says Winckelmann, "who prefer such females, are captivated through the medium of feeling, rather than of vision." The skin in woman possesses also a transparency, which allows the colour of the blood to be discerned in the superficial veins, and produces the beautiful azure tint, which contrasts so charmingly with the clear whiteness of other parts. The cutaneous secretion has been considered to differ in the two sexes. "La transpiration paraît beaucoup moins abondante chez les femmes; elle a surtout, dans certaines parties, une odeur, qu'il seroit difficile d'exprimer, mais qu'un odorat exercé parvient aisément à distinguer chez les femmes qui jouissent avec plénitude de tous les attributs de leur sexe, et qui sont femmes jusque dans leur atmosphère." Moreau, t. 1. p. 171.

The skin of man is always, comparatively, more deeply tinted; it is thicker, rougher, and covered with more numerous hairs. In our account of this organ, too, we have to mention a very characteristic attribute of the male sex, the beard.

This production, which adorns the figure of the male, in the human species, is more or less abundant in different subjects. It does not begin to appear until the age of puberty, and is not completely developed until after some years. Its great thickness depends, perhaps, on the habit of cutting it. In old age a similar production appears in some women; here, however, it is dispersed irregularly, and has not the thickness which it possesses in man; nor does it ever acquire the same length. Yet rare examples have been known of women with long beards. A case of this kind is mentioned in the *Anatomie Descriptive* of Bichat, tom. 5. p. 165, as having been seen at the hospital of the *École de Médecine*. The woman was forty years of age; her breasts were well-formed, and she had had a child. Her beard was as strong as that of a man, and numerous hairs covered the lobuli of the ears.

The characters of sex in those organs which are immediately employed in the generative functions, will be exhibited in the course of this article. We have only to observe further, that the circumference of the anus, which is covered with hair in the male, is smooth in the female subject.

The reader may refer, on sexual distinctions, to Rouffel, *Système physique et moral de la Femme*; to the works of Moreau and Cabanis; to the French *Encyclopédie*, Yverdun edition, art. *Femme* and *Viril*; to Ackermann, *De discrimine sexuum præter genitalia*. Mogunto 1788, 8vo.; to A. F. Nolte, *Diss. in sensu momenta quædam circa sexus differentiam*. Gotting. 8vo. The differences in the general habit and appearance of the body, the softness, delicacy, and inferior stature of the female, as contrasted with the strong sinewy frame of the male, may be seen in the two figures, supposed to have been drawn by Triton, contained in Vesalius, *De Corp. hum. Anat.* Basil. 1542: also in the 1st, 2d, and 3d plates of Bidloo's work; and in the *Cours complet d'Anatomie gravé par M. A. E. Gautier, et expliqué par M. Jadelot*; Nanc. 1773. folio. The unrivalled artists of Greece could not fail to perceive the same distinctions, which they have expressed most admirably in some of the finest monuments of their art, as in the *Venus*, the *Apollo*, and *Heracles*.

The differences which we have enumerated are not very distinctly perceivable, until the two sexes have reached the epocha of their respective perfect development. They are concealed, in the early periods of infancy, under external forms which are nearly the same in both sexes. It is true, indeed, that we can distinguish a male from a female embryo (see *EMBRYO*); but the leading sexual distinctions are by no means fully developed until the age we have mentioned. The muscles have not yet produced any remarkable change in the direction of the bones; the glandular and fleshy parts hardly differ either in form or volume; and the skeleton can scarcely be distinguished by the breadth of the hips and pelvis. The like confusion prevails in the moral dispositions of the two sexes: boys are not distinguishable in this respect from girls. The appetites, ideas, and passions of both are the same. We cannot at present, nor perhaps shall we ever be able to determine, by what particular action the organs of generation influence the other parts of the body, direct their operations, and modify the character and order of the phenomena relating to them. The fact, however, is evident; and the influence is incontestable. For, when the natural development or actions of the generative organs is impeded, the secondary characters, by which the sexes are distinguished, do not take place.

To illustrate this subject, let us observe, that the several differences of animals may be divided into primary and secondary; the former include the differences in the parts of generation themselves, which are originally formed differences, and belong equally to both sexes; the latter are all the other variations depending on these, not taking place until the parts of the first class are coming into use, and being principally, though not entirely, in the male. One of the most remarkable secondary characters in animals, generally speaking, is the superior strength of make in the male; and this strength is generally directed particularly to the organs employed in fighting. Hence it is especially noticeable in the animals whose females are of a peaceable nature; e.g. the legs of the cock and neck of the bull. But in carnivorous animals, where strength is required by both sexes to kill the prey, the differences in the form of the male and female are not so striking, yet the sexes are still distinguished by some differences in their external covering, as the male lion by his mane, and the cock and hen of many birds by the plumage. The general strength of make, the hairy covering, and the voice distinguish the male from the female of the human species. Now in all animals, which are not of any distinct sex, no such alteration takes place in the form at the time of puberty. Thus, the free martin, which possesses a mixture of the generative organs of both sexes, does not exhibit in form a resemblance of either the cow or bull. It is very much like the ox or spayed heifer, being considerably larger than either the bull or the cow, and having horns very similar to those of the ox. The voice is similar to that of the ox, and more like that of the cow than of the bull. The flesh, like that of the ox or spayed heifer, is generally much finer in the fibre, than that of either the bull or cow; it is supposed to exceed that of the ox and heifer in delicacy of flavour, and bears a higher price at market. (See "Account of the Free Martin" in Mr. Hunter's observations on the animal economy, p. 55.) A similar effect is produced, when the sexual parts are removed after birth; the castrated male and the spayed female have both the same common properties, and are very much like the free martin; the artificial removal of the generative organs preventing the occurrence of those changes, which would naturally have occurred at the time of puberty. Thus, by depriving either sex of the true parts of generation

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they seem to approach each other in appearances, and acquire a resemblance to the hermaphrodite. Respecting the changes, which occur at puberty, Mr. Hunter says, "It is evidently the male, which at this time in such respects recedes from the female; every female being at the age of maturity more like the young of the same species than the male is observed to be: and if the male is deprived of his testes when young, he retains more of the original youthful form, and therefore more resembles the female. From hence it might be supposed, that the female character contains more truly the specific properties of the animal than the male; but the character of every animal is that which is marked by the properties common to both sexes, which are found in a natural hermaphrodite, as in a snail, or in animals of neither sex, as the castrated male or spayed female. But, where the sexes are separate, and the animals have two characters; the one cannot more than the other be called the true; as the real distinguishing marks of each particular species, as has been mentioned above, are those common to both sexes; and which are likewise in the unnatural hermaphrodite. That these properties give the distinct character of such animals is evident, for the castrated male and spayed female have both the same common properties; and when I treated of the free martin, which is a monstrous hermaphrodite, I observed that it was more like the ox than the cow or bull; so that the marks characteristic of the species, which are found in the animal of a double sex, are imitated by depriving the individual of certain sexual parts, in consequence of which it retains only the true properties of the species." (See "Account of an extraordinary Pheasant," in Mr. Hunter's observations on the animal economy, p. 75.)

The influence of the generative organs in the development of the body at puberty, and in the modifications which constitute the sexual character, is clearly evinced in the stag, whose amours are conducted in so splendid a style, and evince so remarkable an exuberance of vitality. When he is deprived, at an early age, of the sexual attributes, none of the vigour of the rutting season is displayed; the muscular flesh is softer, and the horns are either arrested in their growth entirely, or are imperfectly formed. Russel castrated a very young stag, and no horns appeared; he operated on an older one, and the horn was partially developed. When he removed one testis at a more advanced age, the opposite horn was the most completely formed; the removal of both glands from two adult stags did not prevent the appearance of the horns; but they were shorter, and neither the investing membrane, nor the horn itself, were afterwards separated. (On the Economy of Nature in glandular Diseases.)

Facts very analogous to these may be observed in the human subject. An imperfect original formation of the sexual organs, or the removal of some of them modifies the whole character of the individual, changes the physical constitution in a very remarkable manner, and influences in a no less striking degree the moral habits and dispositions. Observers in all ages have remarked, that mutilated or imperfect animals possess an assemblage of peculiar characters, all of which have not a very direct relation to the functions of the generative organs. Not only are the sexual desires entirely lost in these degraded individuals, but the whole of their organization is affected in a very singular way. The cellular texture becomes more abundant and lax, and is more loaded with fat; the muscles are weaker; the voice more acute; and the development of the beard is impeded. The change in the moral dispositions is not less worthy of attention. It was the opinion of the ancients, that mutilation degrades man, and brings animals to perfection; the truth is, that it equally degrades both, since it alters their nature.

But, by weakening an animal, it renders him more docile, and better suited to the purposes of man; by destroying the tie, which connects him the most powerfully to his species, it assists in developing those habits of obedience and attention, and those feelings of gratitude and attachment which make him so serviceable to us. A similar effect is produced in man; mutilation separates him in a manner from his species; and the fatal event, which deprives him of the most agreeable relations established by nature, between beings of the same kind, almost extinguishes in his breast the peculiar feelings of humanity.

In those young persons, to whom nature has denied either wholly or in part, the distinguishing powers of the male sex, puberty does not produce its ordinary effects. And moreover, at this time the bony and muscular organs are constantly assuming more and more of the external forms, and general character belonging to the female. These equivocal individuals have an acute voice, weak muscles, a softness and laxity in the general organization. The pelvis, too, has that greater proportional breadth which characterizes this part in women. This circumstance, as well as the consequent breadth, and great roundness of the hips, may be particularly noticed in the castrati. The physical condition is generally accompanied in these individuals with a perfectly corresponding moral state. All these points are fully substantiated in the following account of a marine foldier, aged 23, by Mr. Home, (Observations on Hermaphrodites, Philos. Transact. 1799.) "He had no beard; his breasts were fully as large as those of a woman at that age; he was inclined to be corpulent; his skin uncommonly soft for a man; his hands fat and short; his thighs and legs very much like those of a woman; the quantity of fat on the os pubis resembled the mons veneris; the penis was unusually small, as well as short, and not liable to erections; the testicles not larger in size than we commonly find them in the foetal state; and he had never felt any passion for women. He was weak in his intellects, and his bodily strength." Mr. Home mentions, in the same place, two other still more striking examples. A woman had three children, of which the first and third were supposed to be hermaphrodites; the second was a perfect female. The eldest, when Mr. H. saw him, was thirteen years of age, "of a most uncommon bulk, which appeared to be almost wholly composed of fat; his body, round the waist, was equal to that of a fat man, and his thighs and legs in proportion; he was four feet high; his breasts as large as those of a fat woman; the mons veneris loaded with fat; no penis; a preputium  $\frac{1}{2}$ th of an inch long; and under it the meatus urinarius, but no vagina. There was an imperfect ferotum, with a smooth surface, without a raphe in the middle, but in its place an indented line; it contained two testicles of the size they are met with in the fetus. He was very dull and heavy, almost an idiot, but could walk and talk. The younger one was six years old, uncommonly fat, and large for his age; more an idiot than the other, not having sense enough to learn to walk, though his limbs were not defective. The external parts of generation differed in nothing from those just described, except in the prepuce being an inch long."

An interesting case is mentioned in the Mémoires de la Société médicale d'Emulation, t. 3, p. 293, which tends to confirm the preceding observations. A young man, aged 23, has no testes in the ferotum, which is only indicated by a slight corrugation of the integuments; a very small penis, which never changes its size, and two folds of skin, extending from the latter organ to the anus, and very much resembling the female labia. His stature is below the middle size. The skin is soft, smooth, and entirely free from hair;

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the place of the beard supplied by a slight down. The voice habitually hoarse. The muscles not well marked, and the pelvis and chest resembling those of the female. The intellectual faculties are very dull, and the sexual appetite entirely wanting.

The period, and the manner of mutilation, have considerable influence on the effects of the process. The complete removal of all the external organs is a much more decisive method of annihilating the propensities connected with them, than any partial amputation, or compression, or ligation of the spermatic cords. The operation is also more effectual, when performed in early infancy, than after the period of puberty. Venereal desires have been known to subsist in considerable force, and with the usual external signs, after the removal of the testes in the adult. The moral effects of this mutilation have been strongly depicted by Cabanis. "Eunuchs are the vilest class of the human species; cowardly and knavish because they are weak; envious and malignant, because they are unfortunate. Their understanding shews the absence of those impressions, which give to the brain so much activity, which infuse into it an extraordinary proportion of vital energy, which cherish all the expansive and generous feelings of the soul, elevate and direct all the thoughts. Naïves is almost the only very imposing exception to this rule; he is almost the only eunuch whose name appears with glory in the page of history. Solomon, one of the lieutenants of Belsharius, is another rare example; he exhibited great courage and talents in the war with the Vandals in Africa. How immoral then, how cruel and fatal to society, is the practice of thus degrading and corrupting at pleasure the human species!"

A curious case in the *Philosophical Transactions* for 1805, pt. 2, in which the ovaria were deficient, shews that such a deficiency occasions the female to approach in some points to the male formation. The subject of this narrative died at the age of twenty-nine. "Having ceased to grow at ten years of age, she was in stature not more than four feet six inches high. Her breadth across the shoulders was as much as fourteen inches, but her pelvis (contrary to what is usually observed in the proportions of the female skeleton) measured only nine inches from the ossa ilia across the sacrum. Her breasts and nipples never enlarged more than in the male subject; she never menstruated; there was no appearance of hair on the pubes, nor were there any indications of puberty, either in mind or body, even at twenty-nine years of age." The removal of the ovaries has been most rarely practised in the human subject: probably the only case in which it has ever been done is that recorded by Mr. Pott, where these bodies were contained in inguinal hernia. A healthy young woman, aged twenty-three, large breasted, stout, and menstruating regularly, had a painful tumour in each groin, near the abdominal muscles. The ovaria were removed from these tumours by a surgical operation. "She has enjoyed good health ever since, but is become thinner and more apparently muscular; her breasts, which were large, are gone; nor has she ever menstruated since the operation, which is now some years." (*Pott's Works*, vol. iii. p. 329.) The changes which took place in the latter case seem analogous to what has been observed in some birds. After they have done laying, hen pheasants have been observed to acquire the plumage of the cock in some instances. This has been noticed in wild individuals; but Mr. Hunter had three opportunities of ascertaining the fact by his own examination. He further mentions a pea-hen, which had produced chickens eight times, and which, after moulting at eleven years old, displayed the feathers peculiar to the other sex. The tail of the cock appeared at the same time. This was

repeated for three years, and the spurs of the cock appeared also in the third year. The animal never bred after this change of plumage. The same fact has been noticed in the duck, see Home on Hermaphrodites, in the *Philos. Transact.* 1799. "We may conclude," says Mr. Hunter, "that this change is merely the effect of age, and obtains to a certain degree in every class of animals. We find something similar taking place even in the human species; for that increase of hair observable on the faces of many women in advanced life, is an approach towards the beard, which is one of the most distinguishing secondary properties of man. Thus we see the sexes, which, at an early period, had little to distinguish them from each other, acquiring, about the time of puberty, secondary properties, which clearly characterize the male and female; the male at this time receding from the female, and assuming the secondary properties of his sex. The female, at a much later time of life, when the powers of propagation cease, loses many of her peculiar properties; and may be said, except from the mere structure of parts, to be of no sex; even receding from the original character of the animal, and approaching in appearance towards the male, or perhaps more properly towards the hermaphrodite." *Observations on the Animal Economy*, p. 80.

Nothing can be more absurd than to seek for any mechanical explanation of these accidental phenomena, or even of the more regular phenomena, of which they interrupt the course, at the same time that they elucidate the laws. They cannot surely be derived from the structure of the organs to which they belong, nor from the known nature of the liquors secreted in those organs. But the consideration of some physiological circumstances, which are very simple in themselves, may enable us to escape from this dark abode of occult causes, to which the theories of the ancients were confined, and which have been little changed, except in name, by the moderns. The latter indeed, by substituting, for the opinions of the ancients, other more dogmatical explanations, have given rise to more important and dangerous errors; they have injured men's minds to the pernicious habit of attempting to determine the nature of causes, where we can only observe effects; and in determining these causes they have often personified mere abstractions. In the first place, it is a certain fact, however it may be explained, that the muscular fibres are weaker, and the cellular tissue more abundant, in women than in men. Secondly, we cannot doubt that this difference is produced by the presence and influence of the uterus and ovaria; it takes place infallibly when these organs are originally well formed, and are developed in the natural order. This weakness of the muscles imparts an instinctive distaste for violent exercises; it inclines the individual to amusements, and, when the age admits of it, to sedentary occupations. The greater separation of the hips renders progression less easy in the female, on account of the more extensive change of the centre of gravity. The mode of life in the female is thus indicated a priori by a circumstance in their organization, which might be regarded as trifling, and which can hardly be distinctly observed at an early age. Again, the habitual sense of weakness inspires less confidence. Not possessing the means of acting on surrounding objects by direct force, woman seeks for more indirect methods; in proportion as she finds herself less calculated to exist alone, does she attempt to attract the attention of others, and to fortify her own existence by that of those surrounding beings, whom she judges most able to protect her. These observations would be almost sufficient to explain the dispositions, tastes, and general habits of women. They will naturally prefer those employments which require delicate address rather than muscular force:



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they will employ themselves on little objects: and their minds will consequently acquire acuteness and penetration rather than extent and depth. Thus, as they lead a sedentary life, to which the nature of their employments confines them as strongly as the immediate propensities depending on their organization, we see in a manner a new physical and moral system developed in them. They perceive their own weakness; hence the necessity of pleasing: from the latter circumstance arises the continual observation of all that is passing around them, also their dissimulation, their artifices, their manners, their graces, in a word their coquetry, which, in the present system of society, must be regarded as the assemblage or result of their good and bad qualities.

For reasons exactly contrary to those which have been just explained, boys acquire the opposite original and characteristic propensities: hence they naturally contract opposite manners and habits. Full of the feeling of their growing strength, and of the wish to exercise it, repose is disagreeable and irksome to them: they want lively motion, and they indulge in it with impetuosity. Thus, without entering into farther details, we see that the bent of their ideas and the character of their passions are formed directly by their original dispositions, and the kind of amusements or occupations which these determine them to prefer. Now, the passions and ideas of the grown man are only those of the child developed and completed by the maturity of the organs, and the personal experience of the individual. See Cabanis, *Rapports du physique et moral de l'Homme*, memoire cinquieme.

But nothing hitherto explains to us how modifications of so general a nature can depend on the conditions of certain peculiar organs. We must then ascend a little higher, and inquire whether the remarkable influence exerted by the organs of generation can be at all elucidated by their structure, their functions, or their physiological relations to the other branches of the system. We see, in the first place, that parts supplied by nerves which come from different trunks, or are formed by different nerves united together, are either more sensible or more irritable, and almost always both at once. Nature seems to have placed the ganglia and plexuses in the neighbourhood of the viscera, where the nervous influence must be the most considerable. The epigastric and hypochondriac regions abound with them; consequently their sensibility is very acute, their sympathies very extensive, and the corresponding portions of the intestinal canal enjoy a degree of irritability hardly equalled by that of the heart. Now the nerves of the generative organs in both sexes, without being apparently very important by their size or number, come from various sources, are connected with those of all the abdominal viscera, and by them, or rather by the great sympathetic, which serves as a general medium of connection, with the most essential divisions of the nervous system.

Secondly, observation shews us that the nervous system (of which the original organization and mode of acting determine the general sensibility of all the organs taken together, and the particular sensibility of each considered separately) may in its turn be powerfully modified by the character of those functions, which perform the most important part in the animal economy; that is to say, in other words, by the habitual impressions conveyed to it from some of its most sensible extremities. The loss of one sense does not produce merely an increase of energy or attention in those which remain, and which seem to redouble their efforts in order to supply its place; but it changes the manner in which the nervous system feels and reacts, and hence arise new habits evidently connected with the unusual im-

pressions which these senses then begin to receive. The practice of medicine proves to us, by daily examples, that the affections of various organs have the most marked influence on the tastes, ideas, and passions. The moral dispositions are by no means the same in diseases of the chest, as in those of the spleen or liver. A greater or less propensity towards a particular train of ideas or feelings (as for instance towards those connected with religious belief) is experienced in particular states of languor than in others; and the greatest aptitude to those avocations, which demand either considerable strength and activity in the imagination, or long continued and profound meditation, is often experienced in a state of disease caused by the deranged functions of some of the abdominal viscera. Thus, then, nothing is more conformable to the laws of the animal economy, than that organs, endowed with a singular degree of sensibility, should exercise a very extensive influence on the machine in general; and we perceive immediately that the present is one of the most remarkable phenomena referrible to these laws.

In the work last quoted, Cabanis endeavours to explain this subject further, by observing that those organs, which seem to be the principal seats (foyers) of the peculiar sensibility of the generative apparatus, *viz.* the ovaries and testicles, are of a glandular structure, that the various parts of the glandular system affect each other very powerfully; and that the condition of this system altogether has a most important influence on the state of the brain, augmenting or diminishing its energy. The latter circumstance will apply with so much the greater force to a case, where the glands are distinguished by their great sensibility.

Again, it has been alleged that the seminal fluid formed in the testicles, when absorbed and conveyed into the circulation, affects the general mass of blood. At all events the commencement of this secretion is marked by important changes in the voice, the muscular motions, and the physiognomy, by the appearance of the beard, &c. And we have seen, that in animals, the development of particular parts is materially modified by the presence and action of the testes. That an analogous fluid forms in the ovaries, and either furnishes the materials of the embryo, or contributes to their formation, and that its absorption produces analogous effects in the female, to those which we observe in the male, is in truth a mere hypothesis. But the influence of the ovaries in the changes at the time of puberty, whether produced in this way or not, is incontestible. Lastly, in explaining the different influence of these parts in the two sexes, we must assume peculiar dispositions in the original formations of the nervous system, as well as in the cellular organ, the muscles, and bones. These must depend on those unknown circumstances which influence the formation, life, and development of the embryo; their explanation must be referred to that of the differences of sex, they must be regarded as simple facts, and be admitted as such, without attempting to trace them any higher.

*Hermaphroditism.*—Having compared together the two sexes, and mentioned the most remarkable circumstances which distinguish the organization of each, we have to examine further whether nature has in any instances united the attributes of the male and female in the same individuals, so as to form a true hermaphrodite. The resolution of this question, which is not to be considered as satisfying idle curiosity, is equally interesting to the naturalist and the philosopher, and may influence the decisions of judicial tribunals on the important questions of impotence and sterility. The Grecian artists have endeavoured to combine the beauties and properties of the two sexes in the same subject, and have exerted the magic powers of their chisel on figures of hermaphrodites.

maphrodites. Among these ideal productions, we may mention two beautiful statues in a recumbent position in the Florentine gallery. A small hermaphrodite statue is seen in the villa Albani, a very fine one in the villa Borghese, and there is another in an obscene attitude, pointing out that it partakes of the two sexes. All these are males in the external appearance of their generative organs, females in the form of the breast, in the features, in the elegance of the figure, and the softness of the contours. (Winckelmann, *Histoire de l'Art*, 4to. tome 1. p. 364.) These monuments furnish no proof on the subject; they are to be regarded as creations of art, derived from the imagination of the sculptor, and not as the representatives of any real existence. Winckelmann himself, who, in other respects, believes in hermaphroditism, classes the *chef-d'œuvres* we have just alluded to among the ideal productions. They exhibit an attempt to form a more perfect being, by uniting together the peculiar excellencies of the male and female, without attending very particularly to the genital organs. The word hermaphrodite then, as applied to these works of art, includes the notion of a very high degree of beauty and elegance, in which all that is most admirable in either sex is combined in one individual; and the works, in which such are represented, may be regarded as the inventions of the greatest masters. (See Caylus's *Recueil d'Antiquités*, tome 3.) The fabulous account of the transformation of Hermaphroditus and the nymph Salmacis into a most lovely being, combining the attraction and the powers of both sexes, may be regarded as an expression of the common opinions on the subject.

The vast multitude of observations and histories of hermaphrodites, recorded in various medical works, renders it necessary for us to class them under certain heads. 1st. The true hermaphrodite? There is much reason to believe, that no instance of an hermaphrodite, in the strict sense of the word, has ever occurred in the more perfect quadrupeds, or in the human species. For, when we consider the bones of the pelvis, to which the organs of generation are connected, it is difficult to conceive in what way the complete parts of the male and female could be placed, distinct from each other; and no instance of its having happened is to be found, in any record, which can be depended on. To constitute an hermaphrodite, in the sense we are now considering, it would be necessary that the male organs of copulation and impregnation, such as the testes and their ducts, the *vesiculæ feminales*, prostate, urethra, and penis, should exist in the same individual with the organs employed for the purposes of conception, of receiving, nourishing, and expelling the fœtus, such as a well-formed vagina, uterus, ovaries, and Fallopian tubes. The difficulty, and even impossibility of such an union, has been already recognized by Haller and Pietsch. Medical authors have indeed related cases of women, who, after having many children, had impregnated other females; (see Mollerus, *Tractat. de Hermaphrodit. cap. 2.*: Blancard, *Collect. Medico-Phys. cent. 3, obs. 80.*) but such narratives are too obviously fabulous to require serious refutation.

The nearest approach to such an occurrence, as we have just alluded to, consists in a partial mixture of the female and male organs. This has been observed, not very rarely, in some animals. Mr. Hunter has given several instances of it in neat cattle; and it has also been seen in the dog, the ass, and the goat. The individuals, in whom such appearances have been noticed, are so far from having had the properties of both sexes, that they were obviously incapable of executing any sexual function at all. Even in this restricted sense, we believe that no case has occurred in the human species, and that all the supposed hermaphrodites among men

have been individuals with imperfect or monstrous formations, of some parts. The case mentioned by Petit, in the *Mémoires* of the Academy of Sciences for 1720, as exhibiting a mixture of organs, was clearly a male: and that related by Maret in the *Mémoires de Dijon*, t. 2, p. 157, belongs to the same class. The following case, dissected by Giraud of the Hotel Dieu, shews us how careful we should be in drawing conclusions from external appearances, and will convince us that no accounts of hermaphrodites can be received, except on the faith of dissection performed by experienced anatomists. The individual was essentially a male, and offered some appearances of the other sex, not from the addition of any organs, but from an unusual distribution of some parts of the male apparatus. He was received in society as a woman, and was connected by a voluntary association with a man, who had for a long time performed the duties of a husband towards him. This singular character died in the Hotel Dieu. He exhibited, externally, an assemblage of the male and female properties. The built has a completely masculine appearance; the chin was covered with firm hairs, very analogous to a beard; the neck was thick, the chest broad, the bosom slightly swollen, and the nipples exactly like those of a man. The lower half of the body presented a contrast to these characters. The soft and delicate contours of the lower limbs, the rounded hips, the broad pelvis, and the greater separation of the thighs, approximated decidedly to the female form. An imperforate penis, two testicles, and an appearance of vulva, were the external generative organs. The testes were well formed, the *vesiculæ feminales* imperfect, and the urethra opened at the *cul-de-sac*, which represented the vagina. Thus, instead of a double sex, the individual was an ill-formed male, entirely incapable of any sexual function. See *Journal de Médecine par Sédillot*, tome 2, p. 319.

The last instance of mixed organs, which we shall quote, is mentioned by Dr. Baillie, to whom it was communicated by Dr. Storer of Nottingham. "The person bears a woman's name, and wears the apparel of a woman. She has a remarkably masculine look, with plain features, but no beard. She had never menstruated; and on this account she was desired by the lady, with whom she lived as servant, to become an out-patient at the Nottingham hospital. At this time she was twenty-four years of age, and had not been sensible of any bad health, but only came to the hospital, in order to comply with the wishes of her mistress. Various medicines were tried without effect, which led to the suspicion of the hymen being imperforated, and the menstrual blood having accumulated behind it. She was therefore examined by Mr. Wright, one of the surgeons to the hospital, and by Dr. Storer. The vagina was found to terminate in a *cul-de-sac*, two inches from the external surface of the labia. The head of the clitoris, and the external orifice of the meatus urinæ, appeared as in the natural structure of a female, but there were no nymphæ. The labia were more pendulous than usual, and contained each of them a body resembling a testicle of a moderate size, with its cord. The mammae resembled those of a woman. The person had no desire or partiality whatever for either sex." (*Morbid Anatomy of some of the most important Parts of the human Body*, 2d ed. p. 410.) This narrative leaves very little doubt that the individual was a male, with the generative organs so imperfect as not to have exerted their usual influence on the frame in general: there is no evidence of any female organ being present here.

We repeat then, that there is not only no instance recorded, of perfect male and female organs so united in the human species, as to constitute an individual capable of ex-

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ercising the generative functions of both sexes—of impregnating or being impregnated—but also, that there is no clearly described instance of the smallest mixture of organs in any human person, ascertained by actual dissection, and testified by persons of competent anatomical skill. All the supposed instances of hermaphrodites must then be referred to one of the following classes; in which unusual situations of certain organs, vicious conformations, various monstrosities, imperfectly developed male organs, or a greater prominence than usual of some female parts, occasion a deviation from the accustomed type, supposed to constitute hermaphroditism, very capable, when assisted by lies and fraud, of imposing on those who know nothing of natural appearances, and often mistaken by those who ought to have known better. Hence have arisen the numerous statements, contained even in the writings of anatomists and physicians, and tending to prove the existence of the prodigy, of which no well authenticated fact has hitherto determined the reality. A sound spirit of criticism, founded on a more accurate knowledge of natural appearances, reduces to their just standard those singular deviations from the ordinary type, from which ignorance, credulity, and a love of the marvellous, have drawn such extravagant and ridiculous consequences.

2d Class.—Male individuals, with unusual formations of the urinary and generative organs; (androgynus.) Where the ordinary type is considerably changed, an appearance is sometimes produced, very capable of deceiving superficial observers: there is a kind of sketch, or imperfect attempt, at a double apparatus of organs. But the male sex generally predominates very clearly in these cases, and the ambiguity depends commonly on the testes being contained in separate parallel folds of the skin; the penis being imperforate; and the urethra opening in the perineum, on the surface of a blind pouch, having a red and tender appearance, and easily mistaken for the vagina. In such an individual the penis, being imperforate, and probably smaller than usual, is considered as a large clitoris; the folds of skin holding the testes very much resemble the female labia, and the red slit, behind which the urethra ends, is tolerably analogous to the vagina. The imperforation of the penis, and the opening of the ejaculatory ducts near the perineum, at which their contents escape, deprives these individuals of the power of procreation; and the sterility of their marriages, if they enter into that state, in spite of their imperfect formation, arises entirely from this cause. The testes and vesiculæ seminales appear to be perfect in these cases. The individuals experience the ordinary sexual desires, and the seminal fluids are expelled at the unnatural opening in the perineum. A similar deformity occurs not infrequently in the goat and sheep; Aristotle having observed it in the former. The reader will find examples in Haller's *Commentarius de Hermaphroditis*, where a vast number of instances is quoted; in Wrisberg's *Commentatio de Singulari genitalium Deformitate in puero Hermaphroditum Mentiente*; § 7, note b: in Moreau *Histoire Naturelle de la Femme*, tom. 1. p. 224: in Mertrud, *Dissertation sur la fausse Hermaphrodite*, qui paroit aux yeux du public, Paris 1749, folio: Agoty, *Observations sur l'Histoire Naturelle, la physique, &c. avec des planches imprimées en couleur*, Paris 4to. 1752

An instance, similar to the kind just described, is related and drawn by Wrisberg in the memoir above quoted: but there was this difference, that the rectum, as well as the urethra, opened in the unnatural situation in the perineum; this male child had been christened by a female name.

Other less essential deviations from the accustomed organization have given rise to the opinion that the individuals were

hermaphrodites. A fissure, of various depths, has existed in the perineum; covered with a secretion from numerous sebaceous glands; when all the other organs were perfect in every respect. Wrisberg knew an instance of this kind at Göttingen: the individual was always deemed an hermaphrodite, but he had the natural desires and powers of a male. The absence of the testes from the scrotum has given rise to the same opinions. A confinement of the penis to the scrotum, by a particular formation of the integuments, has occasioned persons to be reputed hermaphrodites. In these the urine is in the direction downwards, and the confinement of the organ will not allow of its performing the sexual functions. The parts may be set free by a surgical operation.

The last description of males, supposed to be hermaphrodites, are those in whom the urinary bladder is deficient, together with the lower and anterior portion of the abdominal muscles and integuments, and the symphysis pubis, a red and sensible mass of an irregular and fungous-like surface, with the ureters opening on it, is placed at the lower part of the abdomen. Considerable alterations take place in the generative organs, in consequence of this deformity. The urethra is deficient, and the penis consequently imperforate. The feminal ducts open near the fungous mass above-mentioned, or on the open surface of the urethra, or even terminate in blind extremities. As the tuberosities of the ischia are at an unusual distance from each other, the crura penis are concealed within the body for a greater length, and the pendulous part of the organ is extremely short, seldom exceeding two inches in length, even in the adult. The urethra appears as if it had been slit open, forming a band or groove, instead of a perfect canal, and rendering the glans penis bifid. The situation of the urethra is also very remarkable; for, instead of running, as it naturally does, in the lower angle formed by the junction of the corpora cavernosa, it has commonly passed along the upper angle, giving the penis and glands the appearance of being inverted. That the part now described is really the urethra, is evident from its vascular surface, with lacunæ opening upon it, from the presence of the caput gallinaginis, and of the openings of the feminal ducts. In consequence of the glands being bifid at its upper surface, the prepuce is attached only to the lower half, and is connected by a frænum, as usual. The testicles, in some instances, are contained in the scrotum, in others in folds of integument resembling the labia of the female; and in some do not descend. The scrotum is rarely pendulous, being increased in breadth in consequence of the separation of the ossa pubis. The sexual appetite, in some of these individuals, has been weak, in others strong, in others altogether wanting. It is evident that they are not capable of procreating the species, in consequence of the shortness and imperforation of the penis, and the feminal ducts opening externally. See Dr. Duncan, jun. on this subject, in the *Edinburgh Medical and Surgical Journal*, vol. 1. pp. 43 and 132: where he has collected together a vast number of cases.

3d Class.—Female individuals; (androgynæ). An unusually large size of the clitoris, is one of those causes which have led to mistakes concerning the sex. This is not a common occurrence in these countries, but is said to be much more frequent in warm climates; in so much that a surgical operation for removing the part is described by the Arabians. These individuals are perfect females in all other circumstances of their organization, and the menstrual discharge sufficiently characterizes them. In many of the recorded instances of this description, there is probably exaggeration, as any enlargement of the clitoris can hardly make it sufficiently

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ciently like a penis to give rise to mistakes. A gipsy applied to Columbus for the removal of a clitoris which incommoded her. The famous hermaphrodite negrefs of Angola, exhibited in London, was in the same case with the gipsy mentioned by Columbus. Parsons has collected many facts of this kind. Mr. Home relates an instance in a negrefs. "She was of the Mandingo nation, 24 years of age; her breasts were very flat; she had a rough voice, and masculine countenance. The clitoris was two inches long, and in thickness resembled a common-sized thumb; when viewed at some distance, the end appeared round, and of a red colour; but, on a closer examination, was found to be more pointed than that of a penis, not flat below, and having neither prepuce nor perforation; when handled it became half erected, and was then fully three inches long, and much larger than before: when she voided her urine, she was obliged to lift it up, as it completely covered the orifice of the urethra. The other parts of the female organs were found to be in a natural state." A gentleman, who had practised midwifery among the negro women, stated that an enlarged condition of the clitoris was common amongst them. Parsons and some others, in consequence of the structure just described, have ascribed all hermaphrodites to the female sex. Whether this unusual size of the organ can be produced, "*per sceleratum abufum clitoridis*" is very doubtful. In order to avoid all mistake concerning sex in newly born children, it must be remembered that the clitoris is proportionally very large at that age.

A prolapsus of the uterus is another circumstance which has occasioned females to be deemed hermaphrodites, and even to be publicly exhibited as such. A person of this kind came to Paris in 1693, dressed as a man, and wearing a sword. She pretended to have the organs of both sexes, and to be able to employ both, and exhibited her person to the curious for a small gratification. Besides the numbers who took up the common opinion of her being an hermaphrodite, and who could not be supposed sufficiently well-informed to judge of such a subject, several physicians and surgeons fell in with the vulgar sentiment, and gave certificates which prove incontestibly, that a great reputation may be acquired in the profession, without any real talents, or any large stock of solid information. Saviard, after inspecting the parts closely, found that the case was a prolapsus uteri, which he reduced. When the female had recovered, she presented a request to the king for permission to take again the female dress, in spite of the magistrates of Toulouse, who had ordered her to clothe herself as a man. See Saviard, *Recueil d'Observations*, obs. 15.

An instance of the same kind is related by Mr. Home. "A French woman had a prolapsus uteri at an early age, which increased as she grew up; the cervix uteri was uncommonly narrow, and at the time I saw her, when she was about 25 years old, projected several inches beyond the external opening of the vagina; the surface of the internal parts, from constant exposure, had lost its natural appearance, and resembled the skin of the penis: the orifice of the os tinctæ was mistaken for the orifice of the urethra. This woman was shewn as a curiosity, and in the course of a few weeks made 40*l*. I was induced by curiosity to visit her, and on the first inspection discovered the deception; which, though very complete to a common observer, must have been readily detected by any person intimately acquainted with anatomy. To render herself still more an object of curiosity, she pretended to have the powers of a male." *Philos. Transact.* 1799.

We have already mentioned some instances where the generative organs, although belonging clearly to one sex, had

been imperfectly developed, and consequently had not produced their usual effect in modifying the form of the body, and impressing it with the sexual character. There are other cases, in which men or women, having their organs apparently of the accustomed magnitude, partake respectively of the characters of the other sex, probably from the cause just alluded to, of the sexual parts not exerting their full influence on the frame. Such individuals may be accounted neuters; and seem, in the human subject, to resemble the free martin in neat cattle, where there is a true mixture of organs, but they are so imperfect that organization is not influenced by them, and the form of the individual differs both from that of the bull and cow. The persons thus circumstanced are often deemed by the vulgar hermaphrodites.

All the cases of supposed hermaphrodites may be referred to one or the other of the heads now described: they will be found to be either males, with some unusual organization or position of the urinary or generative apparatus; or females, with a long clitoris, or prolapsed uterus; or individuals, in whom the generative organs have not produced their usual effect in influencing the development of the body. Thus, it is evident, that instead of combining the powers of the two sexes, they are, for the most part, incapable of exerting any sexual function. Yet ignorance and superstition have marked out these individuals, already sufficiently unfortunate from their defective organization, as the objects of persecution, and have subjected them to the operation of the most absurd and cruel laws. The ancients, regarding them as an impure and ominous kind of monsters, dispatched them by the most barbarous deaths. It appears from Diodorus that they had been burned by the Athenians and Romans. By the edicts of Constantine and other princes, they were beheaded, drowned, or banished to desert islands. Livy informs us that a newly born child, of which the sex could not be ascertained, was thrown into the sea. (*L.* 31.) Further information on this subject may be derived from Gaspar Buhin, *De Hermaphroditorum monstroforumque partium natura*, ex Theologorum, Jurconsultorum, Philosophorum, et Rabbinorum sententia, libri duo, Francof. 1629, 8vo. These absurd notions and practices have at present disappeared; but the subject is important on many accounts, as these unusual deviations render the sex of an individual often doubtful, and impose even on professional persons. The decision may be important in deciding the employment in life of an individual, the descent of property, the fitness for religious functions, particularly for the male or female religion in the Romish church, and the judicial decisions concerning impotence or sterility. We therefore add a few observations on the grounds of distinction in such circumstances. The greatest difficulty is experienced with respect to newly born children; for many things assist our determinations in the adult. The beard, the hair surrounding the anus, the desires excited by the presence of women, the testes and their cords, and the comparatively greater breadth of the shoulders than of the pelvis and hips, shew us that the individual is a man. The smoothness and softness of the body in general, the increase of the beard, and of the hair from the anus, the menstrual discharge, the want of testes, and the superior breadth of the hips, prove the individual to be a woman.

A male, with a fissure in the perineum and an imperforate penis, may be ascertained by the size of the penis, by the different organization of the preputium from that which covers the clitoris; the absence of nymphæ and hymen, and probably the presence of testes. The different relation of the fissure in the perineum to the penis, from that of the meatus

meatus urinarius to the clitoris in the female, will assist the decision, as also the want of power to pass an instrument towards the situation of the uterus.

The smaller size of the clitoris, and its different shape; the connection of its preputium to the nymphæ, and the presence of the latter parts; the separate opening of the vagina and meatus urinarius, and the presence of the hymen; the absence of testicles, all prove the individual to be a woman.

An adhesion of the labia to each other at their convexities may cause a difficulty in deciding: but here the absence of the penis and testicles, the discharge of the urine at the upper end of the labia, and the line of union between those folds, shew us the nature of the case.

Much information on the subject of hermaphrodites may be gained from the following works. Parfons' Mechanical and Critical Enquiry into the nature of Hermaphrodites: London, 8vo. 1741. Ambrose Paré's Works, book 24. Pictsch, Gedanken von den Zwittern, in the Old Hamburg Magazine, vol. iv. p. 538, et seq. Arnaud, in Mémoires de Chirurgie. Haller, num dentur Hermaphrodit, commentarius, in the Commentarii soc. reg. scient. Gottingen, tom. i.; or in his Opera Minora, vol. ii. Hunter on the Free Martin, in his Obs. on the Animal Economy. Home, Dissection of an Hermaphrodite Dog, with Observations on Hermaphrodites in general, Philos. Transact. 1799. Moreau Hilloire Naturelle de la Femme, tom. 1. p. 211, et seq. Wriberg, Commentatio de singulari genitalium deformitate in puero, hermaphroditum mentiente, in his Commentat. vol. i. p. 504, et seq.

*Male Organs of Generation.*—In the human subject these consist of the testicles, vesiculae seminales, prostate, Cowper's glands, urethra, and penis; making up a secretory apparatus, which is double, consisting of a right and left organ, in the two former parts, and single in the latter. The peculiarities of the apparatus consist in the small quantity of fluid which it furnishes, in the long periods for which this fluid is retained in its reservoirs; in the particular condition of the organ destined for its emission, essentially necessary to that act; and in the physical feeling which accompanies the act.

*The Testicles.*—These organs, placed externally to the cavity of the abdomen, and less protected against external injury than most other important viscera, are suspended, each of them by a considerable vascular bundle, called the *spermatic cord*, and contained in a kind of bag or cavity formed of several membranous layers. A middle septum divides the interior of the bag, and separates from each other the right and left testis, with their coverings, which are double with the exception of the outer one. The latter, formed by the integuments, and called the scrotum or purse (in French *les bourses*) constitutes a single bag, which envelopes all the others. The scrotum is attached to the upper and front part of the pelvis, unconnected in every other situation, contiguous laterally to the inside of the thighs, in front to the penis, and separated behind from the anus by an interval of two or three inches, called the *perineum*. A small fold of the skin under the penis, a slight groove below, and a prominent line behind, continued into the raphe of the perineum, mark out successively, on the external surface, the symmetrical division of the organ. Yet the right side of the scrotum is almost constantly more elevated than the left, in consequence of the corresponding spermatic cord being shorter, and the testis nearer to the ring. The scrotum is soft to the feel, and elongated, so that the testes appear loose and hang low, in warm weather, in old persons, after coition, and under the action of any causes which have a debilitating influence on the frame

in general. It is rough and harder on the surface, and shorter in cold weather, in young subjects, at the time of erection, and in a strong, vigorous state of the body: consequently, at such times, it is applied more exactly to the testes, and, drawing these organs gently upwards, shortens the cords. The sudden action of cold, and even of fear, will produce the latter state of the organ. The wrinkles which it exhibits at such times are effaced by extending it.

The coverings of the testes succeed each other in the following order: 1st. The cutaneous investment, or scrotum; 2dly. The cellular layer; 3dly. Membrane of a fibrous appearance, common to the testis and cord; 4thly. The serous membrane. The reason why the dartos is not enumerated among these coverings will appear presently.

The scrotum is continuous with the integuments of the inside of the thighs, the perineum, and penis. It is distinguished by a brownish hue from the rest of the integuments, but follows in general the tints of the latter, being always darker in colour. A few short hairs are scattered over its surface, and their bulbs, obliquely implanted, form sensible prominences from the thinness of the skin, which are not effaced by extension of the organ. In its general organization the scrotum resembles the skin; but it is very thin, so that the veins of the subjacent cellular tissue are visible through it. The vital properties of the scrotum are the same with those of the skin in general; but the contraction produced by cold is more manifest in the former than in the latter. The phenomenon seems to be the same in both instances. It constitutes the cutis anserina of the surface in general. This corrugation of the part has given rise to the opinion that a muscular expansion is found under the skin in this situation; and hence have arisen the descriptions of the dartos. We can, however, clearly distinguish that the contraction is in the integuments, and not in any more deeply-seated part; they feel dense and firm at this time, instead of being soft and loose, as in their ordinary state.

The testis and cord are surrounded in their situation by a copious and loose layer of cellular substance, placed immediately under the skin, and constituting, where it divides the two testes from each other, the septum scroti. This is rather more dense immediately under the cutaneous integument, and looser at the surface of the testis. Several blood-vessels ramify through it, particularly veins; and hence arises an appearance which may have authorized the opinion concerning a muscular covering on a superficial examination: but accurate inspection can discover no muscular fibres. Many nervous filaments are also seen in this substance, and enable us to explain the acute sensibility observed on the removal of the testis in surgical operations, a little fat is seen near the ring and the urethra; but it is completely absent from all other situations. Here, as in the penis, the eye-lids and some other parts, the abundant deposition of fat would interfere with the functions of the organ; and its absence in these situations seems to indicate the design and foresight employed in the construction of the body as fully as the particular construction of any parts can do. However the size of the body in general may be increased in corpulent persons, the scrotum, penis, &c. always retain the same dimensions. The absence of fat renders these parts more especially subject to the watery depositions of anasarca: such effusions often manifest themselves first in the scrotum, and that organ is generally very much increased in bulk when the anasarca is considerable. The impulsion of air through an opening in the scrotum demonstrates very well the nature and extent of this cellular layer; by distension of this kind it resembles cotton in appearance. Maceration in water may be employed for



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for the same purpose; as the fluid penetrates very minutely into the cellular interstices. It is continuous with the similar covering of the penis, and with the cellular substance of the perineum and groins; so that air passes from it into these situations.

The cord and testis are closely enveloped by a condensed cellular covering, which descends from the neighbourhood of the abdominal ring, and includes the organs just mentioned, together with the membranous coverings of the latter; it constitutes the elythroid or erythroid coat of some writers. The cremaster muscle is strongly connected with this, and contributes to the formation of the cellular sheath. This part has been described as the tunica vaginalis of the spermatic cord, but it is entirely overlooked by many writers. Its thickness differs considerably in different subjects. It is connected to the cellular substance of the scrotum externally; and adheres, by cellular connections, to the spermatic vessels, and to the tunica vaginalis testis, on the inside. If air be impelled through a small opening, it is separated from these parts, and may be divided so as to shew that it is a distinct membrane. It then appears semi-transparent and thin, and seems to consist of fibres variously interwoven. Its thickness is much increased in scrotal ruptures, to which it gives a complete external covering. Camper has delineated it very well in his posthumous plates edited by Soemmerring, and he describes it in the following paragraph; "*Cremasteres igitur musculi sunt, ab obliquo interno et transverso abdominis orti, per involucrem membranaceum sub cute feroti dispersi, quocum velamentum efformant, funiculum spermaticum et testem undequaque cingens, quodque in herniosis crassius tenaxque fit, et ex multis sibi invicem impositis lamellis consistere videtur, cum chirurgica hernias attingimus. Velamentum illud facile a facco hernie digiti separatur; formius autem adheret vasis spermatices.*" *Icones herniarum, p. 13.*

The serous membrane of the testis is called the *tunica vaginalis*, and the name should be confined entirely to it, as most of the anatomical descriptions apply to this part only. Like all other serous membranes, this forms an entire and unperforated bag. Its arrangement is simple. It forms a pouch-covering, and appearing to include the testis and epididymis, as the heart is included in the pericardium. When an opening is made into it, and air impelled, it is elevated into a bag on the front and sides of the testis. At the posterior edge of the organ it is reflected over its surface, covering the epididymis, a small portion of the spermatic vessels, and the whole testis; and giving to these parts a smooth external coat. The tunica vaginalis therefore may be said to consist of two parts; *viz.* an exterior portion, forming the bag, which includes the testis; and an internal, reflected over the surface of the organ. The two are continuous at the back edge, and at the upper and lower ends of the testis. The bag-like portion of the membrane is covered by the fibrous investment already described: the reflected part adheres very closely to the epididymis and testicle. The tunica vaginalis is very thin, and every where cellular on its external surface; internally it is smooth, polished, and moistened by a serous secretion, which, in an increased quantity, constitutes hydrocele. There is hardly any sensible fluid in the ordinary state of the parts. Sometimes there are partial adhesions between the opposed surfaces of the two portions of the membrane; and sometimes a general adhesion, by which the cavity is entirely destroyed, is produced by the operation for the radical cure of hydrocele.

In man and quadrupeds the testicle consists of two parts; *viz.* the proper testis, and the epididymis, which adheres to it behind. Ordinarily the scrotum contains two of these

glands, a right and a left one: but this number is not invariable. We shall explain hereafter how it may happen that the scrotum should contain no testis, or only one; and, if authors could be credited, we might cite examples, in which there have been three, four, or even five. We believe that the number never exceeds two, that the statements now alluded to have arisen from the swellings incidental to these parts, being mistaken for testes, and that there is no observation deserving of credit by which this assertion can be contradicted. The ordinary size of the gland in the adult is an anatomical fact known to each individual; but there are some varieties in this respect. Long continued chastity probably causes a shrinking of the organ; and a similar diminution, to a much greater degree, may be occasionally observed in old subjects, when the function of the part has ceased, without any disease. On the contrary, when venereal enjoyment has been habitually indulged, temporary abstinence will cause a swelling of the organ, with some pain; and this may be relieved by a spontaneous discharge of the secretion. Again, there are differences of volume from original formation. The right and left glands are not always of the same size, nor is the right particularly observed to exceed the left, as some have asserted. The figure of the part is pretty exactly oval, with the two ends placed perpendicularly, and the surface flattened in the direction of the small diameter. The extremities, which are distinguished by the epithets superior and inferior, are not in the same perpendicular line; the former is inclined forwards and outwards; the latter backwards and inwards. The two ends are sometimes almost anterior and posterior. The flat sides, which are external and internal, are turned, the former towards the thigh of the same side, and the latter towards the corresponding surface of the opposite gland. The edges of the testes, which are anterior and posterior, are placed obliquely, so as to slant from above backwards and downwards. The anterior edge is sometimes described as the inferior, and the posterior as superior. The epididymis is a thin and elongated organ, placed along the back edge of the testis, to which it adheres by means of the tunica vaginalis and blood-vessels, smaller in the middle and enlarged at its upper and lower ends, and reflected at the latter, to form the vas deferens. Its upper extremity is called the caput epididymidis or globus major (*tête de l'épididyme*); and this adheres very firmly to the upper end of the testis, being placed rather above, as well as behind it. From this point the organ descends in a thin and flattened form, distinctly seen as a separate part in the side of the testis, which is turned towards the thigh, but not on the opposite surface. It swells again at the lower end into the globus minor (*queue de l'épididyme*) and then turns up to form the vas deferens. The spermatic cord is attached along the posterior edge of the gland, and the greater or less obliquity of the testis depends on the mode of its connection. A cord, composed of the same parts, suspends each testis in its place, but it is rather longer on the left side; a circumstance which has been noticed by painters and statuaries. The pathologist ascribes to this circumstance the more frequent occurrence of varicocele on the left side of the body. The distance of both organs from the ring is variable, and depends on the state of the scrotum, and the cremaster muscle. These two parts generally contract together. The consistence of the gland is soft to the feel. As it is covered almost entirely by the serous membrane already described, it acquires from this circumstance a smooth and polished surface; its whiteness arises from the tunica albuginea.

*Structure of the Testicles.*—The glandular part of the organ,

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in which the feminal secretion is immediately effected, is a light brown pulpy mass, considerably softer than the parenchyma of the other glandular organs, contained in a strong fibrous membrane, which determines the exterior configuration of the part, and the consistence which it presents on examination. This membrane is named the tunica albuginea. It is seen through the reflection of the tunica vaginalis, which envelopes the testicle, and adheres to it very closely. Yet, notwithstanding the strength of this adhesion, the serous layer may be partially separated by dissecting from the epididymis forwards. But, over the general surface the union is too intimate to admit of separation; and consequently the serous layer and the true albuginea are described ordinarily as composing one membrane under the latter name. It is from analogy, rather than the direct testimony of anatomical observation, that we describe them as distinct parts. Along the posterior edge of the testis, the albuginea is perforated by numerous openings for the passage of the feminal and blood-vessels. From the inner surface of this membrane are detached numerous delicate processes penetrating the substance of the testis, and forming partial septa, by which the glandular mass is slightly subdivided into smaller portions. Some of these productions seem to consist of blood-vessels. The structure of this part classifies it amongst the fibrous membranes: it is dense, very firm, of a peculiar white colour, and possessing some blood-vessels. Its external surface is every where covered by the reflected tunica vaginalis, except at the back of the testis, and its inner surface is in contact with the glandular substance of the organ. The great closeness and firmness of its texture explain to us the peculiarly hard feel of the inflamed testis, as the membrane yields with difficulty to the distention produced by the swelling of the contained vascular parts. It is manifestly thicker where the feminal tubes penetrate it; and in this situation we observe the corpus Highmori, concerning which we have further observations to make below. The albuginea possesses extensibility, and the corresponding contractility: the swellings of the testicle, from various causes, shew the former, and its subsequent return to the natural size, as well as the shrinking of the part from age demonstrate the latter. It is very subject to conversion into cartilage. Little excrescences are sometimes observed on the surfaces of the gland, about the size of a pin's head.

The tunica albuginea is filled with a soft pulpy matter, of a light brownish-yellow hue, and divided into small portions or lobuli. Imperfect cellular septa, along which the small arteries and veins run, divide these portions; but the partitions are not merely vascular. They are attached, as we have already observed, to the internal surface of the albuginea. Behind, they unite together in a white cellular hue, running along the back edge of the testicle, from above downwards. Such are the appearances exhibited in the recent organ, without any dissection or preparation. Its substance is very soft, so that when dried it loses more than eight-tenths of its weight. A more accurate examination, particularly with the assistance of maceration and putrefaction, discover that all this pulpy mass is made up of convoluted serpentine threads possessing some firmness and connected together by a very soft cellular substance. These, which are called the tubuli or ductus feminiferi testis, seem about the size of an ordinary sewing thread, and can easily be drawn out with a needle, after maceration, to the length of an inch and even more. These threads are tubular, cylindrical thick in their coats with small calibre, plentifully supplied with minute vascular rami-

fications, from which however injected liquors do not pass into the ducts. They do not ramify, but pass in a tolerably straight direction to the cellular line at the back of the testis. That they are tubular is proved by the possibility of injecting them with quicksilver from the vas deferens: this indeed often fails, but in some cases the tubuli are filled in this way through the whole testis. The diameter of one of these ducts, according to Monro, is 1-200th of an inch; or 1-120th when injected with quicksilver. By the calculations of the same anatomist, the testis should appear to consist of 62,500 tubes, supposing each to be one inch in length: and consequently, if they were joined into one tube, it would be 5208 feet and 4 inches in length. The convolutions and turns of the ducts are so numerous, that they do not continue their course, in the same straight line, for more than 1-40th of an inch.

The white and firm cellular line at the back of the testis, just at the adhesion of the epididymis, is called the corpus Highmori. Many anatomists have described it as tubular, and have assigned to it the office of conveying the semen to the epididymis. Such a part obviously exists in the testis, and is still more manifest in animals, as in the boar, than in the human subject. Haller, who has given the most accurate account of this subject, says, "After I had accurately filled the vas deferens with quicksilver, I observed in the corpus Highmori numerous vessels, larger than the tube of the epididymis, running according to the length of the gland, serpentine, easily torn, and communicating with each other." *Elem. Physiol.* v. 7. p. 445. In these the tubuli feminiferi testis terminate; and they constitute the rete vasculosum of the organ. The ducts contained in each part of the tubuli feminiferi end in one straight tube, which terminates in the rete testis. A certain number of tubes, called the vasa efferentia, convey the semen from the rete vasculosum to the commencement of the epididymis. Obscure notices of these vessels may be found in various writers, and De Graaf in particular has described them. But the labours of Haller have thrown the greatest light on the subject. "When, after various unsuccessful attempts, the continued labour of an hour or more had enabled me to fill completely the vas deferens, I observed the head of the epididymis to be made up of vascular cones, amounting in number to twenty or thirty, and connected together by cellular substance before any dissection had been used. Each of these cones is made up of a single small vessel, larger however than the tube of the epididymis, convoluted into innumerable folds. The basis of the cone is turned towards the epididymis; its apex is a vessel proceeding downwards to the testis, perforating the albuginea, and communicating with the rete testis." *Ibid.* p. 447.

The epididymis, of which we have already described the position and figure, is distinguished by its greyish colour from the shining whiteness of the testis. Being placed at the point where the cord is attached to the testicle, it is surrounded by blood-vessels, of which several are distributed to itself: its surface is partially covered by the reflection of the tunica vaginalis, which adheres to it closely, except at the angle of reflection, where the connection is looser. Its structure is much more easily unravelled than that of the testis, for, when filled with quicksilver from the vas deferens, it is proved to consist of a single tube, almost infinitely convoluted upon itself, excepting only a small part of the caput, which is made up of the vascular cones. The latter uniting together form one very small tube, which by its serpentine course and turns, connected to each other by cellular substance, containing the ramifications of blood-vessels,

vessels, forms the body of the epididymis. As it descends along the back of the testis, it increases in diameter, and at the same time is proportionally less convoluted. In a considerably enlarged state, it is reflected from the lower end of the testis, still a little convoluted at first, but soon forming a straight tube, called the vas deferens. By carefully destroying the cellular substance, which connects together the convolutions of this tube, we can demonstrate the facts now mentioned concerning the structure of this organ. In such a process the tube can be drawn out to a surprising length, to five ells, according to De Graaf, to 400 times the length of the epididymis in its natural state, according to Heurermann. Monro has taken great pains in measuring and calculating the dimensions of this part: he finds the diameter of the tube, on an average, to be 1-80th of an inch, its length 31 feet, and the number of its turns, as it does not go in a straight direction at any part, for more than 1-30th of an inch, 11,100. (De femine et testibus in variis animalibus, p. 31 and 32). As a further proof, that the organ is made up of a single tube, we may observe, that if we cut it across while we continue to inject quicksilver from the vas deferens, the fluid escapes from one orifice only, and when that is tied, no more runs out.

Thus, the semen, first formed in the small serpentine vessels (*tubuli testis*) which make up the pulpy mass of the testis, is deposited from thence in the straight seminiferous tubes, which convey it into the rete vasculosum, placed at the back of the testis, and connected to the albuginea, where it forms the corpus Highmori. Hence it passes through the vasa efferentia, or excretoria testis, about twelve in number, which perforate the albuginea, at the upper end of the testis, and then form, in a convoluted state, the serpentine vascular cones, which make up the caput epididymidis. These unite into a single small tube, which, by its numerous turns, first forms the epididymis, and then ends in the vas deferens. Haller, *Programmata de vasis seminalibus*, Gotting. 1745; and in *Oper. minor t. 2. p. 5*.

From the origin of the convoluted tubuli seminiferi, to the termination of the epididymis in the vas deferens, the semen goes through a series of vessels, which are folded 16,860 times, and, if extended in a straight line, would exceed 42 feet in length. Monro, *lib. cit.*

The smallness of these tubes prevents us from ascertaining their texture, or the nature of their sides. The tubuli testis possess considerable firmness, as we may ascertain by extending them until they break, and by observing the column of quicksilver which they support, when we inject them. The tube of the epididymis possesses firm and strong sides, in comparison to its cavity.

A small tube, either straight, or slightly convoluted, is sometimes observed to arise from the epididymis, and after passing to various distances on the cord, to terminate in a cul-de-sac. Its size is equal to that of the tube of the epididymis itself. This circumstance was first noticed by Haller, who called the vessel *vasculum aberrans*. (*Progr. de vas. seminali*) He did not undertake to determine its termination or nature, observing that it proceeded along the cord, "incerto fine: an lymphaticum?" The existence of the vasculum aberrans has been confirmed by Monro, who injected it in four out of sixteen testicles; and he adopts the opinion suggested by Haller, of its being a lymphatic. Mr. Cruikshank takes a different view of the matter. "It is," says he, "a lusus naturæ, and either forms a cul-de-sac, or, after many convolutions, returns back again upon itself, and terminates where it began. It sometimes mounts four inches upon the cord, and then terminates in a cœcum, or blind end. Sometimes it is not a quarter of an inch in length. I

have seen it convoluted, like the epididymis itself; from which it could not be distinguished, till, by maceration and dissection, the cellular membrane had been removed. It may be compared with the diverticulum ili, so frequently met with in the human intestines." *Anatomy of the absorbing Vessels*, p. 121.

*Vessels of the Testicle: Spermatic cord.*—Under the inferior extremity of the kidney, and about the middle of the psoas magnus muscle, we observe a fasciculus of blood-vessels, lymphatics, and nerves, placed behind the peritoneum, and connected to that membrane by a cellular substance: this is the commencement of the spermatic cord. It descends over the psoas muscle, passing at the same time rather outwards, crosses the ureter, continues its course over the iliacus internus, and arrives at the upper opening of the abdominal ring. Here it is increased by the accession of the vas deferens, from the side of the bladder. It now penetrates the upper aperture of the ring, going under the inferior edge of the obliquus internus, and transversus abdominis: then it turns downwards and forwards in the canal placed between the two openings of the ring, covered in front by the aponeurosis of the obliquus externus, and lying behind on the fascia transversalis. In this part of its course, it is further increased by the accession of the cremaster muscle. The cord finally emerges through the opening in the tendon of the obliquus externus, and then turns suddenly downwards; lying not so much on the bone between the two columns of the ring, as on the outer column itself, so as to cover its insertion into the pubes. Just at the point, where the cord enters the abdominal canal, it lies on the root of the epigastric artery. As it is placed behind the peritoneum, in the whole of its descent from the loins to the abdominal ring, that membrane is not perforated at the point where the cord leaves the abdomen. Nor is there any sheath continued from the peritoneum, along the cord, to the tunica vaginalis; although such a structure has been ascribed to the human subject from the observation of animals, in which it is really found. In bubonocœle, indeed, a membranous cavity, produced by a continuation of the peritoneum, lies over the cord; but this is disease: and in a particular period of fetal existence, there is a canal leading from the abdomen to the tunica vaginalis, but this is ordinarily closed before birth. Neither is there any foundation for the description of two layers of the peritoneum, of which the ureter is said to accompany the cord. Escaping through the opening in the tendon of the obliquus externus abdominis, the cord descends in a straight course to the testis, covered externally by the fibrous sheath already described, and growing rather larger as it approaches the organ. Copious soft cellular substance, with very little fat, connects together the component parts of the cord.

The spermatic are the chief arteries for supplying the testes and their coverings. These vessels are the longest in their course, compared to their diameter, of any in the body; they were known to the ancient physicians, and called by them the *seminal* vessels. They would probably have escaped the diligence of the dissector, had not the importance of the part, which they supply, been more attended to, than the size of the tube. They arise, most commonly, from the front of the aorta, between the origins of the renal and inferior mesenteric vessels; either near together, or at a small distance from each other. This is the case in twenty-two out of thirty-five instances. They may arise from the aorta higher or lower than the point which has been mentioned. The artery of the right testis sometimes comes from the right renal; but the left arises much more commonly from the renal artery, inasmuch, that this has been described as the accustomed organ. Often a smaller branch from the renal joins

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the trunk of the spermatic. It descends at an acute or half-right angle, and goes in front of the vena cava, on the right side of the body; but has been seen behind that vein. Its course is rather tortuous; joining the vein on the psoas muscle, it descends along the cord, and arrives at the testis in two branches. It gives off small twigs to the renal capsule, fat of the kidney, ureter, lumbar glands, and the cord itself. The area of the vessel, instead of being diminished by all these branches, is rather increased. Several ramifications are dispatched, below the ring, to the cremaster, tunica vaginalis, and cellular substance of the scrotum. Ultimately it is distributed in numerous branches to the epididymis and testicle; these partly perforate the back of the albuginea, and are employed in supplying the pulpy substance of the organ. Some of the ramifications communicate with branches of the epigastric artery. Smaller arteries come to the spermatic cord, or testicle, from the epigastric, or from the circumflexa abdominalis. The scrotum, and its cellular substance, receive twigs from the arteries of the thigh. "Hence," says Haller, "tying the spermatic arteries does not destroy the testis, on account of the supply derived from the external vessels; but as these are very small, the venereal powers of the organ are lost." *Element. Physiolog.* v. 7. p. 430.

It has been asserted by many anatomists, and some of considerable celebrity, that the spermatic arteries and veins communicated together: and Eustachius has drawn large communicating channels. That injection will sometimes pass from one order of these vessels into the other, when dexterously impelled, is very true, and it holds equally good of other parts; but there is no more than the ordinary kind of communication here.

The spermatic veins, like the arteries, are two in number: the right usually terminating in the front of the vena cava, the left in the renal vein, either alone, or in conjunction with the capsular, or a lumbar, or the hemiazyga. The left spermatic may end in the vena cava; or the right in the renal vein. Sometimes the vein ends by two, three, or four branches in the cava and renal vein. The size of the vessel is very considerable when compared to that of the artery: its diameter being nearly alone and a half. When the vessel has reached the psoas muscle, it divides into branches, which unite again, and give origin to other ramifications, which also anastomose together, and so on: thus a large plexus of veins is formed, constituting the *corpus pampiniforme*, forming the chief bulk of the cord, and increasing in size as it approaches the testis. Branches corresponding to these arteries, which arise from the spermatic, join the vein. Valves are found in the spermatic veins, but none at their termination: the tendency to the formation of varices in these vessels, shews the necessity for the existence of valves. The veins of the scrotum, derived from the epigastric, communicate with the spermatic, and with those of the penis.

The absorbents of the testicles are numerous and large, but have not been long known. Nuck had demonstrated them by injecting the spermatic veins; and Moore rejected them when he had thrown quicksilver into the vas deferens. He observed four or five valvular vessels arising from the rete testis, and ascending the cord. Haller candidly admits that he did not know much of them; "In homine aliquoties vidi majuscula, non tamen valde numerosa, in funiculo feminali cum venis ascendenti, valvulosa, ut tamen neque originem, neque hanc fatis accurate viderem." (*Elem. Physiol.* v. 7. p. 435.) Mr. Cruikshank has given us the most perfect account of these vessels. "The absorbents of the tunica vaginalis," says he, "are easily discovered, lying between the reflection of that coat and the tunica albuginea. Though they are thus situated, I know that they belong

equally to the body of the testicle; they are in great numbers, and I have sometimes covered the albuginea with absorbents injected with quicksilver; perhaps there is not any part of the body where the absorbents are larger or more numerous, in proportion to the part, than they are here. They soon leave the albuginea, and get upon the cord, where they are joined by others, to be described presently; but the tunica vaginalis has also other absorbents, upon the anterior and lateral parts, which have not the least connection with the body of the testicle, nor with the albuginea, and which also soon blend with the former, on the beginning of the cord. The absorbents, which arise out of the rete testis, are exceedingly large, and appear to have no connection with its coats. A very beautiful preparation of these vessels I made at Windmill-street, at least ten years ago: I injected the vas deferens with quicksilver, and had in view not only the filling of the epididymis, but the tubuli testis themselves. I had forced the mercury along the epididymis, and was delighted to see it get into the body of the testicle; the mercury continued to descend very quickly through the glass injecting tube, but I soon found that it was not running into the tubuli testis; but into some vessels, which mounted along the cord: these I soon perceived were absorbents. I have also injected them from every part of the epididymis, from its superior extremity, from the middle, and from the lower end. The absorbents, having reached the cord, form from six to twelve trunks or more; some of these are sometimes larger than a crow-quill: they do not appear to anastomose with one another as they pass along the cord; at first they run straight upwards, in the direction of the ring of the external oblique muscle; after which they are bent upon themselves, and pass a little way in the direction of the spine of the ilium; after which they are bent as it were a second time upon themselves, and run over the anterior surface of the psoas muscle, and terminate at last in the lumbar glands. The reason of their termination, so distant from their origin, will easily occur to those who reflect that the original situation of the testicle was at this place, and that it was natural for it, like the other viscera, to receive its blood-vessels and nerves from the nearest trunks, and to return its absorbents to the nearest glands." *Anatomy of the absorbing Vessels*, p. 140.

The nerves, like the blood-vessels of this organ, arise from the trunks contained in the abdomen, and have consequently a long passage to their ultimate destination. They are rather numerous than large. They are produced from the renal plexus chiefly, with additions from the mesenteric and hypogastric plexuses, and from the trunk of the great sympathetic. They are closely connected to the vessels in the cord, but can hardly be traced to the testis. The scrotum and cremaster are supplied by the lumbar nerves. Although the testis does not appear to possess acute sensibility, compression of the organ causes a peculiar, dull, and intolerable sensation, of the most distressing kind.

Besides the parts just enumerated, the cord contains the vas deferens, which will be presently noticed; and the cremaster muscle, which is described under the article CREMASTER.

A soft and loose cellular substance unites together the parts which have been just mentioned; it resembles that of the scrotum in not containing fat generally; but in corpulent persons small depositions of adipous matter may be observed in it. It does not communicate with that of the scrotum, as the fibrous covering of the cord is interposed between them; and it is much less subject than the latter to anasarcaous affections. Indeed its quantity is proportionally less abundant. Yet in rare cases it has been the seat of aqueous infiltration, constituting a very uncommon kind of hydrocele of the cord: the latter complaint shews itself more frequent-

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ly in the form of a single cyst with smooth sides, contained in the cellular substance of the part.

The *vas*, or *ductus deferens*, is the tube which conveys the semen from the epididymis to the urethra. Its figure is for the most part cylindrical, and it consists of a very small tube, which will only admit a large bristle, with very thick sides. Although its calibre is so small, the diameter of the part on a section equals a line. The substance of its sides is very firm, and cuts like cartilage; hence we can distinguish it by the feel from the other component parts of the cord, by sliding them between the finger and thumb in the living subject. The internal surface of the tube is smooth. Nothing of a muscular structure can be discerned in its composition.

It arises from the posterior and inferior part of the epididymis, ascends behind and a little on the inside of that organ, and then continues its course along the spermatic cord behind the vessels to the ring. Compression of this part occasions the same kind of pain as is experienced when the testes are injured; and the very acute suffering observed on tying the cord in castration, has been explained by the circumstance of this tube being included in the ligature. Perhaps this explanation may be doubted, as the nerves of the testes are also among the compressed parts; however, the *vas deferens* is easily omitted, as its hard feel enables us to separate the vessels which lie in front, and are connected to it by a loose cellular substance. It passes through the abdominal canal, holding the same relative situation to the spermatic vessels. It separates from them behind the opening, and then bends downwards and backwards along the surface of the psoas muscle, and of the iliac vessels, to enter the pelvis. Here it becomes attached to the posterior and lateral part of the bladder, and descends obliquely from without inwards, just in the situation where the peritoneum is reflected to the bladder from the side of the pelvis, connected by cellular substance on one side to the bladder, and on the other to the peritoneum, and situated in front of the rectum. In this course it decussates the umbilical artery, behind which it passes: it also crosses the ureter, being placed between the lower extremity of that canal and the bladder. At the lower and back part of the latter organ it turns forwards and inwards, so as to approach towards the canal of the opposite side, still connected to the surface of the bladder: in this direction it continues along the under surface of the organ, within the *vesicula feminalis*, and connected below by cellular substance to the rectum. In the neighbourhood of the prostate, the two *vasa deferentia* are placed close together, and each unites just at the surface of the gland, with the anterior extremity of the *vesicula feminalis*. The canal, resulting from this junction, sometimes called the ejaculatory duct, penetrates the substance of the prostate, from below and behind, upwards and forwards, and opens in the urethra at the side of the *veru montanum*.

The commencement of the *vas deferens* is a little convoluted, and rather larger in its calibre: at the upper part of the testis it becomes straight in its course, and its area is diminished. Under the bladder it is considerably enlarged again, where it lies along the inner edge of the *vesicula feminalis*. It has here sometimes a slightly serpentine course, and possesses a flattened form. Its cavity is proportionably augmented, and, instead of a cylindrical tube, presents a reticulated texture, like that of the *vesiculae feminales*. Its surface is irregular and tuberculated in consequence of this cellular structure. After receiving the tube of the *vesicula feminalis*, it is again diminished remarkably in size, and forms a small cylindrical canal.

The *vas deferens* receives arterial and venous ramifications from the trunks, in the neighbourhood of which it passes. Nothing is known of its nerves.

It is by no means common in animals for the *vas deferens* to join the *vesicula feminalis* in the manner already described. In all cases where there are testicles, that duct conveys the secreted fluid into the urethra, there being no *vesicula* in some, while in others they terminate by separate openings. The communication between the two parts in man is a very free one; and, although the canal formed by their junction proceeds in a straight direction to its termination in the urethra, yet quicksilver, or any other injected fluid, or air thrown into the *vas deferens*, passes into, and distends the corresponding *vesicula* before it gets into the urethra. The compression of the common canal by the firm substance of the prostate, the small size of the tube and of its opening, and a particular turn made by it, have been assigned to explain this fact. If the injection is pushed further, it will go to the urethra. Fluids thrown into the *vesicula* also distend the *vas deferens*, but are more readily admitted into the urethra, as the capacity of that vessel is not considerable.

The *vesiculae feminales* are two soft bodies, resembling, when undisturbed by dissection, membranous tubes with blind extremities, convoluted, and therefore marked with risings and grooves on their surface. They are situated under the inferior flattened surface of the bladder, and upon the upper surface of the rectum, being connected to both these organs by loose cellular adhesions. They are pyriform, with the apex placed forwards, and the basis backwards, and convergent from behind forwards. Their anterior extremities, joined, as we have already mentioned, to the *vasa deferentia*, lie on the upper and back part of the prostate, and would be in contact with each other, were they not separated by the tubes just alluded to. From this point they grow gradually broader, and are divergent, terminating behind in rounded ends, which are the most distant from each other. The superior surface, in contact with the bladder, is rather flattened: the inferior, lying upon the rectum, is slightly convex. The *vas deferens* runs in contact with the inner margin, and the outward edge is turned towards the side of the bladder. The posterior broad and rounded ends are partly in contact with the peritoneum, and lie at the sides of the pouch, formed where that membrane is reflected from the bladder to the rectum. Numerous arterial and venous ramifications, particularly the latter, and a considerable quantity of cellular substance, surround these organs in all directions, and connect them to the neighbouring parts. In some individuals the pyriform shape is not well marked; but the anterior and lower end is always small. The flattened appearance of its surfaces is altered by injection: the whole organ then appears thicker, and the tubercular risings of the surface are more distinct.

A very different appearance is produced when these bodies are unravelled by the anatomist. Each *vesicula* is then found to consist of a single tortuous tube, about the size of a writing quill, with a blind extremity, and several lateral appendices, which also end in cul-de-sacs. Sometimes the latter are very few; perhaps one or even none. In other instances they may amount in number to ten, or more. Haller has seen seventeen larger, besides smaller ones. Some of these are simple blind appendices; others, particularly near the anterior end of the organ, again branch out. Sometimes the whole *vesicula* is bifid almost from its very origin; the varieties, indeed, are so numerous, that

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two vesiculae will hardly be found exactly resembling each other; but these variations are not important. (See Monro de Testibus, tab. 3.) This tube, with its appendages is so convoluted upon itself, the turnings being closely connected together by cellular substance, containing numerous vascular ramifications, that the organ, when undistended, is four or five times shorter than the unravelled tube; and a section of it in this state makes it appear to be composed of numerous cells, communicating together. This fracture accounts to us also for the knotted appearance of the organ on its surface.

The structure of the vesicula is analogous to that of the vas deferens: its fibres are not so thick, but they are still dense and strong. The external coat is of a close texture, and whitish colour, covered with cellular substance externally. Nothing of a muscular nature can be discerned here, although the functions of the organ oblige us to admit that it possesses a contractile power. We cannot otherwise account for the expulsion of the contents of the vesicula. The action of the levatores ani, which has been assigned as the efficient cause of this expulsion, is certainly inadequate to account for it; as their ordinary daily exertion is attended with no such effect, when the venereal orgasm is not present, and these parts are not exerted in their specific manner. We may observe, moreover, that the perineal muscles contract at the moment of ejaculation; now the contents of the vesiculae must be conveyed into the urethra in the previous moments. The internal surface of the vesiculae is formed by a mucous lining, connected closely to the preceding tunic. Its colour is whitish, and its thickness not considerable. It is continuous with the lining of the urethra. Its surface is very minutely reticulated, and marked with extremely small divisions, not to mention the larger septa formed by the turnings and folds of the tube and its appendages. It has, moreover, a downy or villous appearance: a similar structure characterizes that enlarged portion of the vas deferens which lies along the edge of the vesicula. The structure of these parts, as well as the junction of the vas deferens and vesicula at an acute angle, has very considerable analogy to the gall-bladder and ductus hepaticus. Both have the same reticulated internal surface; the union of the two tubes, and the supposed course of the contained fluids, are considered to be similar.

Some anatomists have described glands as being contained in the substance of the coats of the vesicula, and secreting the mucous fluid poured into these organs; but the most careful investigation does not lead us to detect any thing glandular, and the secretion is probably performed by the surface of the parts.

We proceed to describe more exactly the canal by which the vesicula and vas deferens communicate with the urethra. The tube of the former assuming a smooth appearance on its internal surface, and rather diminished in size, converging towards its fellow, joins the corresponding vas deferens at a very acute angle: it is still considerably larger than the latter canal. When the parts are dissected, and the connecting cellular membrane removed, as in the hepatic and cystic ducts, the junction appears to be effected at a half right angle. The canal formed by this union, and belonging equally to the vesicula and vas deferens, proceeds more directly in the course of the latter, lies in close contact with its fellow, passes between the prostate and neck of the bladder, and thus arrives at the under surface of that part of the urethra, which runs through the gland. A small elongated eminence is found in this portion of the urinary canal, composed of its internal coat, broader behind, where it assumes

an oval figure. Towards the front it is continued into a long prominence, which is simply a fold of the urethral lining, and disappears in the bulb, ending in one of the long fimbriae, of which several are seen in the urethra, and sometimes bifid, or even radiated at its extremity. It is called caput gallinaginis, or veru montanum. The elevations of the lining of the bladder, continued from the ureters, terminate in this eminence. Its oval portion is hollow, and presents a long slit leading into a cul-de-sac, which can be inflated, but which has no communication with the femoral passages. On each side of the eminence there is a small oblong opening, the termination of the ejaculatory duct, but much narrower than the calibre of that tube, which is suddenly reflected from within outwards, at nearly a right angle, and pours its contents, by this small opening, into the urethra. There is no valvular structure at these orifices. The slit and cul-de-sac already mentioned have given rise to an opinion, that the two ejaculatory ducts terminated by a common orifice, which is altogether erroneous.

The prostate is a firm glandular body, placed behind the symphysis pubis, in front of the neck of the bladder, and surrounding the commencement of the urethra. In most animals there are two separate glands in this situation, and the expression *prostates* has been erroneously transferred to the human subject. The size and figure of this part have been not unaptly compared to those of a large chestnut. Its broader end is turned towards the bladder, and is divided by a slight fissure into two lateral lobes, the narrower part is situated forwards. It is considerably thicker from side to side, than in the vertical direction. The superior surface corresponds to the arch of the pubis, but is rather behind that part: it is covered by a strong fibrous expansion, descending from the arch, and named the inferior ligament of the bladder. Below, the gland is connected by close cellular adhesions to the upper surface of the rectum, and the contact of these two parts is more extensive in proportion to the size of the gut, which, when much distended, rises slightly on each side of the prostate, so as to be endangered in the lateral operation of lithotomy. The convex prominent sides are covered by the anterior fibres of the levator ani. The basis, or broad posterior part, which is gently concave, embraces the neck of the bladder, and the small anterior ends of the vesiculae feminales and vasa deferentia. The cellular substance, which connects it here to the bladder, is very dense and firm, and the muscular fibres of the organ are partly interwoven with it. This part presents the groove already mentioned as dividing the organ into two lateral lobes. In front, the narrower portion of the prostate is lost indefinitely on the membranous part of the urethra, to which it adheres most firmly. The bulk of the urethra, the fat and muscles of the perineum, cover the part so deeply on its anterior aspect, that it can by no means be felt from the surface: on the upper part of the rectum, however, the gland may be distinctly recognized by the finger introduced into the gut, as nothing but the intestine covers it in this situation: and it projects sensibly into the tube when enlarged.

The urethra, immediately at its origin from the bladder, passes through the prostate from behind forwards, and the membrane is almost consolidated with the sides of the opening in the gland. This passage does not take place at the centre, but nearer to the superior surface, so that a small portion only of the gland is above the urethra, and the chief bulk of it below and at the sides. At the inferior part of the opening, by which the urethra commences, a small portion of the gland projects slightly towards the bladder; and



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this part is perforated by the feminal ducts. It has been particularly described by Mr. Home as forming a third lobe of the prostate. See the description of a small lobe of the human prostate gland in the *Philos. Transact.* 1806, pt. 1.

The external surface of the prostate is covered by a more or less distinct cellular investment, which is the most complete below, and surrounded by numerous vascular ramifications, particularly of the venous kind. For an account of some muscular fibres connected to it, see COMPRESSOR.

Its structure is rather obscure; for it does not constitute a simple gland with one excretory cavity, nor is it separable into smaller constituent portions. It is dense and very firm to the feel, apparently homogeneous when cut into, of a light brown colour, and on the whole considerably resembling a scirrhous mass. Small cavities are scattered through it, and excretory ducts, from 7 or 8, to 12 or 15 in number, continued from these, open into the commencement of the urethra, on each side of the *caput gallinaginis*. From these openings, a white and thickish fluid may be expressed in considerable abundance: it differs essentially in its colour from that contained in the *vesiculæ feminales*.

*Cowper's glands*, are two small glandular masses, so named from the anatomist who particularly described them, and published figures of them; see his *Descriptio glandularum, quarundam nuper detectarum, &c.* 1702. They have also been called the inferior, or smaller prostates, or *glandulæ accessoriæ*; they are of a roundish or oval figure, rather flattened, about the size of a pea, placed on each side of the lower end of the bulb of the urethra, and covered by the accelerator muscle. They may be easily demonstrated by cutting through the middle of that muscle, and reflecting it towards each side: they are of a reddish-grey colour, and composed of many little portions, united together by cellular substance. Each of them has a separate excretory duct, about half an inch in length, running obliquely forwards, and opening into the urethra by an aperture, which will admit a hog's bristle. They secrete a mucous fluid, of a reddish colour, which assists in lubricating the lining of the urethra. According to Morgagni, they are sometimes wanting. Haller has always found them, when he sought for them carefully. Cowper describes a third gland as being placed under the pubes in the curve of the urethra; but this has not in general been admitted.

*The Penis.*—After this description of the organs, which secrete and preserve the feminal fluid, or form other liquors which are added to the produce of the testicles, we proceed to shew how this is conveyed to the place of its destination in the female. The urethra is a common passage for the semen and urine, commencing at the bladder, continued along the penis to its extremity, at which it opens, and facilitating, by its connection with this organ, the transmission of the fecundating liquor to the germs prepared in the generative parts of the female. The penis is a very leading character in the structure of the male, and is the seat of enjoyment in the act of copulation. Its form is elongated, and nearly cylindrical; it is placed at the middle and lower part of the abdomen, in front of the symphysis pubis, and at the bifurcation of the lower limbs. When not erected it is soft and pendent, hanging in front of the scrotum. Its length and size are not constant, even in this condition, in the same individual: for there are numerous degrees between the considerable diminution of bulk produced by the operation of cold, and the swelling, which precedes erection, in any of which the organ may be found according to circumstances; yet there is a middle state, in which it is commonly found, which is not the same in all individuals. In the erected state it is lengthened, enlarged, changed in its direction, and rendered,

by the swelling of the urethra, somewhat triangular: a slight curvature may be observed in it at this time, adapted to the direction of the vagina. The increase in the length and size of the penis is always the same in the same individual; and it is more considerable in proportion as the dimensions of the organ in its state of repose are greater; but this is not constant. We may notice a superior and inferior surface, two sides, an anterior and a posterior extremity.

The upper surface, named the dorsum, or back of the penis, is inclined forwards; it is turned towards the abdomen, and becomes posterior in the erected state. A large vein runs along its middle, and sometimes there are two trunks. The inferior surface, turned backwards, is placed against the front of the scrotum; it forms a prominent line from the course of the urethra, and the integuments in this situation have a longitudinal rough mark, called the *raphé*, continuous with a similar part in the scrotum. On each side of this middle prominence there is a superficial depression, where the urethra is in contact with the *corpora cavernosa*. The two sides of the penis are rounded. The posterior extremity, called also the root of the penis, is divided into three portions, which will be presently described, *viz.* the urethra in the middle, and the two *corpora cavernosa*, one on each side. The anterior extremity presents the glans and prepuce.

The penis is made up of various parts, each of which serves some particular purpose in the functions of the organ, considered as an instrument of reproduction. 1st. The *corpora cavernosa*, making up its chief bulk, soft and loose in the state of repose, are so organized as to become very suddenly increased in size and hardness, in consequence of the operation of certain stimuli. By these the penis is rendered capable of introduction into the female vagina. 2dly. The urethra, by which the fecundating liquor is conveyed, is a membranous canal, surrounded by a vascular substance, called *corpus spongiosum*, which is susceptible of the same change in erection as the *corpora cavernosa*. 3dly. The glans is a small organ, consisting of a continuation of the *corpus spongiosum*, covered by a highly organized and acutely sensible skin, the excitation of which, in the act of coition, determines the discharge of the feminal fluid through the urethra. The penis possesses an external cutaneous covering, which is simply contiguous to the glans, but united to the *corpora cavernosa* and urethra by cellular substance.

The *corpora cavernosa*, or *crura penis*, are two nearly cylindrical bodies, of a very firm texture, united laterally in the greatest part of their length, but separated from each other behind, like the branches of the letter V, and terminating by slender, conical, and pointed extremities. These, fixed behind to the rami of the ischia and pubes, advance forwards and inwards, approximating to each other. In front of the symphysis pubis they come in contact, or rather, are confounded together in one single body, the size of which is uniform throughout, except in front, where it terminates by a blunt extremity. The separate origin of the two lateral portions has led anatomists in general to speak of the *corpora cavernosa* in the plural number; but their consolidation into one body has induced Sabatier, and some other modern authors, to admit only a single *corpus cavernosum*, bifurcated behind for a double insertion into the pelvis. The single body, formed by the union of the two *crura*, to which the bulk and firmness of the penis are almost entirely owing, is flattened above and below, and presents two surfaces, a superior and an inferior, on each of which there is a longitudinal groove, corresponding to the septum, which is within the *corpus cavernosum*. That of the upper surface is the smallest, and lodges the great veins of the penis; the inferior, broader and deeper, receives the urethra, to which it is

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united by a close cellular substance. The sides of the body are rounded and covered by the skin, its anterior extremity forms a blunt point, receding into a cavity, in the base of the glans. The two parts are united by a very dense cellular substance, and some blood vessels pass between them, but there is no other kind of communication; and air or injection thrown into the cellular substance of the corpus cavernosum, do not find their way into the glans. The latter, therefore, is not an emanation or continuation of the former, as some old anatomists supposed. The posterior extremity is bifurcated, and its two prolongations form the two crura penis already mentioned. These begin in a pointed form a little above the tuberosities of the ischia, from the inner surface of the bone, to which they are attached as far as the symphysis. Below and within they are covered by the erectors and accelerator muscles, above and without they adhere strongly to the bone. They leave between them a triangular space, filled by fat, and by the urethra, which occupies its middle. Three parts are to be considered in the corpus cavernosum, viz. an external membrane, a peculiar spongy substance, and a longitudinal septum, occupying its middle. The outer membrane is of a fibrous nature, very thick and firm, whitish in its colour, and following on the body its peculiar figure. Its external surface is covered with a dense cellular tissue; on the inside it adheres closely to the spongy substance. Thinner on the crura, in the groove lodging the urethra, and at the anterior extremity, it presents in these situations a livid tint, produced by the contained blood, while it is thicker every where else, whitish, and opaque. In the former situations there are some perforations for the admission of blood-vessels. It is continuous and strongly interwoven with the periosteum of the os innominatum, at the origin of the crura. It partakes entirely of the character belonging to fibrous organs; and is made up of fibres variously interlaced, and forming several strata. It is found to be very hard and resisting, when exposed to the action of a cutting instrument. It experiences a passive dilatation from the influx of blood in erection, and returns to its former state, when this effusion goes off. It does not seem to possess any vital properties.

The spongy matter of the corpus cavernosum is a cellular substance, composed of very fine and numerous plates and fibres detached from the internal surface of the fibrous membrane, and descending each other in every direction. Its cells are all communicated together, and are more or less filled with blood, which can be removed by forcible squeezing, or repeated washing. Various fibrous threads cross the cellular substance in different directions, and are attached to the surface of the fibrous membrane. They are said to prevent excessive dilatation of the corpora cavernosa. An artery and a vein pass through the centre of the cellular substance on each side, from behind forwards. Their minute ramifications must, undoubtedly, communicate with the cells of the organ, since injection will pass from the arteries into their cells; and injected fluids or air, after filling the corpus cavernosum, gain admission into the veins. The blood contained in the corpus cavernosum has always a dark livid appearance in the dead body; but it is red during life, as may be seen in amputation of the penis, or in living animals. Its quantity varies very considerably, according to the condition of the penis; when it is relaxed, the whole corpus cavernosum is dilated; from the bony origin to the glans, it is elongated and hardened, and erection is produced.

The septum of the penis divides it longitudinally into two portions, which most anatomists consider as distinct tubes, under the name of corpora cavernosa. In order to see it well, the fibrous membrane should be cut through on each

side of the penis, and all the spongy substance removed; the septum will then be found continuous, by its two edges, with the fibrous membrane, and composed of strong whitish fibres, not forming an entire plane, but leaving intervals between them, at which the two sides of the corpus cavernosum communicate freely. From this structure the name of septum pectiniforme has been derived. The intervals between the fibres are larger towards the inferior than the superior edge of the septum. At the part where the two crura meet together, the septum is complete, it degenerates into separate fasciculi towards the opposite end of the organ, and the intervals between these are more considerable, as we approach nearer to the front extremity.

The dimensions of the penis are determined in great measure by the corpus cavernosum; and to this body the organ owes that firmness in the erected state, which enables it to fulfil its office in the business of generation.

Each of the crura penis gives attachment at its origin to a tolerably strong muscle, named the *erector penis*, probably, because when a power, capable of producing the effect indicated by that name, was sought for by anatomists, this muscle seemed to be their only resource. At present the name appears very ill adapted, since the muscles in question obviously draw the penis downwards and backward, instead of upwards and against the pubes. Those who explain the erection of the penis, by the compression of its vein, should find out a power capable of elevating the organ against the bone, and of carrying it forwards. It has a tendinous origin, below the attachment of the crus penis, from the inner surface of the tuberosity, and ramus of the ischium. It passes forwards, upwards, and a little inwards, and is firmly implanted in the fibrous membrane of the crus penis. It will draw the corpus cavernosum downwards, so as to bring it more nearly into a direction, suitable to the cavity of the vagina; it has a slight power of shortening the crus penis, and thereby expressing the blood into the anterior part of the organ, so as to increase its turgescence. Its origin and course render it completely incapable of compressing the large vein of the penis.

The *urethra*, which, in the female, belongs only to the urinary passages, constitutes moreover in man an essential part of the generative apparatus. Its length is very considerable, and its organization very complicated, in consequence of the latter office. It has connections with almost all the parts belonging to this apparatus; the ejaculatory and prostatic ducts open into it; it is closely connected to the corpus cavernosum, and terminated by the glans. In the male subject it forms a canal extended from the neck of the bladder to the end of the penis, and giving passage to the urine and semen. Its length, which varies in different individuals, and in subjects of different ages, is about nine or ten inches in the adult. At its origin it penetrates the prostate, passing forwards and downwards; it goes under the symphysis pubis, and then ascends in front of that part, between the two crura penis, in order to reach the inferior surface of the corpus cavernosum, and become attached to the channel which we have already described. Being thus united to the corpus cavernosum, it runs along the whole length of that body, and follows its direction. Lastly, it traverses the glans penis, and opens at its extremity, by a vertical slit with slightly rounded edges of a bright red colour. Hence the canal forms in its course curvatures resembling those of the letter S; but this is only when the penis is relaxed; for, in the erected state, the curvature in front of the pubes, of which the concavity is turned downwards, is entirely effaced, and that only remains, which is below the pubes, and of which the concavity faces upwards.



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The canal is divided into three portions, distinguished from each other by their organization. The first, of about an inch in length, which passes through the prostate, has received no name; the second, of about equal extent, continued from the prostate to the bulb, is called the membranous portion; the latter corresponds above to the inferior surface of the symphysis pubis, but is about half or three quarters of an inch below the bone. Below it is connected by cellular substance to the surface of the rectum, and at the sides, the front edges of the levatores ani are in contact with it. This part of the canal has been called the membranous portion, from a notion that the membrane of the urethra was covered here by no external investment, but in fact it is closely furrowed by a thick stratum of muscular fibres. The most interior of these are circular, and lie close upon the membrane of the urethra. Mr. Wilson has lately described some fibres, arising by a double tendon from the arch of the pubes, descending on each side of the urethra, and united under the canal. (See the *Medico-chirurgical Transactions*, vol. i.) These fibres are connected in front with the accelerator urinæ, and behind with the levatores ani. They will compress the canal when they contract, and, by closing it at the time of emission, will prevent the seminal fluid from being driven backwards by the action of the accelerator. The third portion of the urethra, including all the rest of the canal, is called the spongy part. It begins by an oblong rounded portion, named the bulb of the urethra. This is situated below the union of the crura penis, between which it makes a remarkable prominence. Below, and on the sides, it is covered by the accelerator urinæ (see *ACCELERATOR*), and by Cowper's glands. Together with the two preceding parts of the canal, the bulb forms the first curvature of the urethra, and its sides are strongly connected to the arch of the pubis by means of a fibrous expansion, termed the triangular ligament of the urethra. The latter part possesses the figure, which its name indicates; the base of the triangle is turned downwards, the apex upwards, corresponding to the junction of the ossa pubis, and the sides are attached to the rami of the pubes. It is perforated by the passage of the urethra, which it holds firmly in its relative situation to the bone. In the rest of its extent, the spongy portion of the urethra corresponds above to the channel in the under surface of the corpus cavernosum. Below, it is covered near the bulb by the accelerator, then by the cellular substance of the scrotum, and afterwards by the integuments of the penis.

The diameter of the canal is by no means uniform in its whole length. It is large in the middle of the prostate, and smaller where it enters and leaves the gland. The canal is here rather flattened laterally. In the membranous portion it is perfectly cylindrical, but small in its size; and the narrowest portion of the whole canal is just where the bulb and membranous part join. In the bulb it is again considerably enlarged, and after contracting slightly, preserves a cylindrical figure and uniform size to the base of the gland. There it again dilates, and forms what some anatomists have called the fossa navicularis; its anterior opening is somewhat narrower. Mr. Home took the trouble of ascertaining the dimensions of the canal by filling it with wax, and measuring the call thus formed. The length was nine inches; from the external orifice to the bulb, seven. The membranous portion was  $\frac{1}{4}$  inch, and the prostatic part of the canal half an inch. The diameter of the call, at  $\frac{1}{2}$  of an inch from the external orifice, was  $\frac{9}{20}$ ths of an inch in a subject of 80 years, and  $\frac{7}{20}$ ths in one of 30 years; at  $\frac{1}{4}$  inches from the external orifice  $\frac{7}{20}$ ths; at the bulb of the urethra  $\frac{12}{20}$ ths; in the membranous part, immediately adjoining

the bulb,  $\frac{7}{20}$ ths; in the middle of the prostate  $\frac{11}{20}$ ths; at the neck of the bladder  $\frac{9}{20}$ ths. Home on Strictures, vol. i. p. 24, and 25.

The situation of the eminence, on which the ejaculatory ducts open, called the veru montanum, in the prostatic part of the urethra, and its figure, have been already noticed; as well as the opening of the prostatic ducts in the same part of the canal. In the rest of its extent, the internal surface of the canal possesses a reddish colour. In the membranous and spongy portions, longitudinal folds are observable, disappearing on extension. These are not seen in the prostate, nor at the gland, because the firm texture of the parts which adhere so very closely to the mucous membrane, keeps it constantly smooth. Hence the diameter of these parts is nearly uniform at all times. The sides of the canal exhibit openings of numerous small oblique ducts, frequently named after Morgagni. These are only seen in that part of the urethra which is in front of the bulb, and are sometimes called lacunæ; their number and size vary in different subjects. They run from behind forwards, and terminate by simple oblique orifices. They are always very numerous about the fossa navicularis, from which some have explained the circumstance of this part being particularly affected in gonorrhœa. They consist of short canals, formed in the membranous sides of the urethra, lined by a continuation of the internal membrane of this canal, and about large enough to admit a large hog's bristle. They are of various lengths, but commonly about a quarter of an inch. Sometimes several smaller join into one larger duct. If carefully examined, their whole number will not be found less than 60 or 70. No glandular apparatus can be discerned connected with them. In these tubes the mucous fluid is secreted, by which the surface of the urethra is smeared, and defended from the action of the urine. Where these lacunæ do not exist, as in the bulb, membranous portion and prostate, a protecting fluid is furnished from other sources, as Cowper's glands and the prostate. The fluid of the lacunæ seems to be a clear viscid secretion, similar in appearance and tenacity to the white of egg. In this form it can be expressed from the openings on the surface of the urethra. Under various circumstances of disease it is increased in quantity, and variously altered from its natural properties, as in gonorrhœa and gleet, and in stricture. In some of these instances, it is a clear, transparent, viscid fluid, being the natural secretion in a more abundant form.

The sides of the urethra are differently organized in different parts; it is lined indeed throughout by a mucous membrane, but this is covered externally by very different structures. Where the canal is passing through the prostate, the sides are formed merely by the mucous membrane, closely united to the gland by a dense cellular texture. The firm substance of the prostate, so intimately connected with the canal, gives to it a strength and thickness in this part. The membranous portion is differently circumstanced; this is the thinnest, and least firmly supported division of the canal, and, as it is placed in the bend of the urethra, is particularly liable to injury in the employment of the catheter. Even here the membrane is covered by a dense cellular texture, continued from the prostate, and by the muscular fibres already described. In the spongy portion of the urethra, the sides of the canal are covered by a substance of peculiar organization, analogous in its effects to that which fills the corpora cavernosa penis. This is called corpus spongiosum urethrae, or corpus cavernosum. It begins in front of the membranous part of the canal, by a large protuberance already mentioned, as the bulb of the urethra. It forms an oblong rather elongated production, hanging between the

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corpus penis and below the canal of the urethra, sometimes bearing a slight appearance of division into two lateral parts by a middle line, and terminating behind by a rounded end. The bulb corresponds only to the inferior surface of the urethra; but a thinner layer of the corpus spongiosum, continued from the bulb, covers the urethra on all sides in front of that body to the end of the canal. Here it is again increased in quantity, and reflected over the anterior extremity of the corpus cavernosum penis, to form the glans. The spongy substance surrounds the urethra uniformly on all sides. It is closely connected to the corpus cavernosum above by cellular substance, and by vessels which are seen when the urethra is detached from its channel; below and on the sides it is covered by a cellular sheath, common to it with the corpus cavernosum penis. The external surface of the corpus spongiosum consists of a thin but compact fibrous layer; and the interval between this and the mucous membrane seems to be filled by a very fine cellular net-work, the cells of which contain venous blood. The tenacity of the external layer occasions the part to possess a livid colour, as the tint of the blood is discernible. This network is covered in the glans by a highly organized species of skin, through which the colour of the venous blood is not discernible. The corpus spongiosum does not consist, according to the common opinion, of a cellular texture; but it is made up of very small and repeatedly convoluted veins, as may be ascertained distinctly enough by inspecting attentively the surface of it, when successfully injected: this structure is more evident in some animals, as particularly in the dog. The bulk of the corpus spongiosum depends on the quantity of blood which it contains; and this part admits of the same distinction, as the spongy substance of the corpora cavernosa penis, and for the same purposes. Air, impelled into any part, finds its way readily over the whole extent of the substance, and the same circumstance may be observed of injection. It may be readily injected from the large vein at the back of the penis; but the valves sometimes prevent the success of this attempt.

The canal of the urethra is lined by a mucous membrane, continuous with the lining of the bladder at one extremity, and with the cutaneous covering of the glans at the other, and sending prolongations into the mucous sinuses of Morgagni, the ducts of Cowper's glands, the ejaculatory ducts, and those of the prostate. Its surface is perfectly smooth, excepting the longitudinal wrinkles, which are effaced by extension. The color is a bright red at the external orifice, and in the fossa navicularis; in other parts it appears pale, when the blood has been expressed from the corpus spongiosum. But the injection of coloured fluids proves that it receives every where an abundant supply of blood-vessels. Its substance is very thin, and the opinion of its being covered by a continuation of the epidermis does not seem to be at all well-founded, as there is a well marked line of separation at the glans, and no cuticle can be shewn in the canal. The external surface is rough and cellular for its connection to surrounding parts. No appearance of muscular structure can be discerned in any part of the membrane. The introduction of an instrument shews this membrane to possess acute sensibility; and the repetition of the practice evinces the force of habit in blunting such feelings. The first time of passing a bougie or sound is sometimes attended with fainting, and almost always with sharp pain, but after a few times, no unpleasant sensation is excited. The passage of the urine is attended ordinarily with no sensation; but this becomes most acutely painful when the membrane is inflamed. It has been much disputed whether or no this canal possesses a contractile power in its own lining. The phenomena are

strongly in favour of the affirmative, although no muscular fibres have been demonstrated. The temporary obstruction to the flow of urine, under circumstances of disease, and the sudden cessation of this inconvenience, can hardly be explained without allowing a contractile force to the membrane. The expulsion of instruments from the canal is another phenomenon of the same kind. That the urethra is extensible, and that it returns again to its original size, is proved by the passage of instruments. Haller states that chemical stimulants will cause it to contract.

The *glans* is the body surmounting the anterior and upper part of the corpus cavernosum penis, and forming the front extremity of the organ, of which it augments the length in a trivial degree. It has the form of a cone, slightly flattened from before backwards, with its base very obliquely truncated. Its apex presents the aperture of the urethra already described. Below this, is placed the frenum connecting it to the prepuce; and on each side of this fold it swells into a small convex protuberance (*colliculi glandis*). This part is called by Haller "sinus acrimini fedes." The glans cannot be said to extend below the urethra, as that part belongs to the corpus spongiosum. Since the basis is so obliquely truncated, the depth of the organ is very inconsiderable at the two convexities already named; but it is much more considerable above, where it is produced over the corpus cavernosum, and terminated by a thick rising edge of a semi-lunar outline, with the convexity turned backwards, called the *corona glandis*. This margin, sufficiently thick and prominent to elevate the integuments, and cause a perceptible rising externally, forms the front boundary of a cul-de-sac, or gutter, caused by the reflection of the inner membrane of the prepuce over the glans. Below, the corona glandis is interrupted by a small groove, which extends to the orifice of the urethra, and gives attachment to the fold which forms the frenum. In some subjects this groove is hardly perceptible. The *colliculi glandis* are continuous below with the corpus spongiosum; the basis of the glans is hollowed out, and the anterior extremity of the corpus cavernosum penis is received into the concavity. In consequence of this structure, although the glans appears to be an inch or more in length, it makes very little addition to the length of the penis.

The substance of the organ consists of a spongy matter similar to and continuous from that of the urethra. Air or injected fluids pass readily from one into the other. This matter is made up, as in the urethra, of convoluted veins, and it admits of the same changes of laxity and erection from the same causes. Sometimes there is an appearance as if the corpus spongiosum urethrae and the glans were separated from each other by a septum. The substance of the glans is always more dense, and contains less blood than that of the urethra. The surface of the organ is covered by a very vascular and delicate production of the integuments, continuous towards the apex of the glans with the mucous lining of the urethra, and at its basis with the inner layer of the prepuce. This covering is very thin, and smooth and soft to the touch. Its external surface is composed of a delicate epidermis; this is succeeded by a layer of the true skin, of a very soft and delicate structure, covered with numerous small villous processes, which are most distinctly seen about the *corona glandis*. The most favourable method of observing these villi is to plunge the part in boiling water, which separates the cuticular covering; they are then visible in vast numbers over the whole surface, giving it an irregularity in its appearance. This circumstance in the structure of the glans was first demonstrated by Albinus (Annot. Academ. lib. iii.), and is admitted by Ruych and Winflow, although

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although some anatomists have questioned it, probably because the demonstration is rather difficult. That the nerves of the organ are continued into these papillæ, as they are in the tongue, and that the exquisite sensibility of the glans arises from this organization, is rather matter of probable conjecture, than the result of direct proof. The blood-vessels of this cutaneous production are numerous, so that a general redness is produced by minute injections. The opposed surfaces of the glans and prepuce are smeared over with a white, friable, and unctuous substance, of a very peculiar odour, moistening the parts and preventing the effects which might otherwise follow their mutual attrition. In animals there are manifest glands to secrete this substance, and an apparatus of glandular structure destined to the same office has been described in man. This kind of sebaceous matter is formed in other situations of the body by peculiar glandular organs, as in the eye-lids by the Meibomian glands; and the notion that it is deposited by the urine, which is contrary to all observation, and to every thing we know of the properties of that fluid, would be immediately overturned by the fact, that a similar deposition occurs under the preputium clitoridis of the female, where the urine could not form it. Although in many subjects no glands can be seen, they are occasionally obvious enough, and are now universally admitted, under the name of glandulæ odoriferæ. Morgagni, in his *Adversaria*, has given a very particular description of them, and Haller confirms his statements. They are hardish, white, and very small bodies, particularly observable about the corona glandis, and in the channel behind that part, where the prepuce is reflected. Morgagni also mentions them near the frenum in the prepuce. "I have seen," says Haller, "five rows of them in the corona, but their number diminished towards the frenum, so that no more than two rows could be seen." They can be observed most advantageously when the cuticle has been removed. That the orifices of these bodies can be seen, and their sebaceous contents squeezed out, is not so clearly ascertained; but both these facts are asserted by competent witnesses. They may be rendered more evident when enlarged in disease; and might be mistaken for venereal pimples, if their symmetrical arrangement did not throw light on the appearance. That the matter secreted by these glands accumulates under the fore-skin, in the form of a white, soft, and greasy substance, where the necessary attentions to personal cleanliness are neglected, and that in hot weather, it may become acrid and irritating, so as to produce excoriation and even ulceration, are well known facts. The inhabitants of warm climates are chiefly exposed to these inconveniences, and the most important advantage of circumcision consists in its obviating such accumulations. Hence we know that Christians, living under the burning sun of Senegambia, submit to this operation, and that uncircumcised Europeans, living in the East, very frequently experience the ill effects arising from the source just alluded to. For this reason Guido de Cauliaco, a celebrated surgeon of his time, about the middle of the fourteenth century, observed that circumcision was useful to many others besides Jews and Saracens: "propter a quod non congregantur sordities in radio balani et calefacient ipsum." *Chirurgia*, tr. vi. doctr. ii. p. m. iii.

The glans penis possesses a very exquisite sensibility, particularly in persons where it is habitually covered by the prepuce; this feeling is only observed on certain occasions, and is the source of that physical sensation experienced at the expulsion of the feminal fluid. It swells and becomes firm in the act of erection, as well as the rest of the penis.

The cutaneous covering of the penis is continuous, at one end, with that of the scrotum and pubes, and at the other

with the prepuce. It is thin, furnished with numerous sebaceous glands, particularly at the under surface, and marked in that situation by a rough line, called the raphé, running along the middle of the organ, and continued with a similar one on the scrotum. It is darker coloured than the integuments in general, and has a few hairs towards the root of the organ. The cellular texture connecting the skin to the penis is very loose, and contains no fat except close to the pubes; hence the skin adapts itself with the greatest facility to the varying bulk of the organ, falling into wrinkles in the collapsed state, and extended more smoothly in the erected condition. It is continuous with the cellular substance of the scrotum, groins, and pubes, and air passes readily between them. Towards the surface of the corpus cavernosum it becomes more dense, and assumes the form of a regular membranous covering; it is more and more loose towards the surface, and has, when inflated, a cottony appearance. The suspensory ligament of the penis is placed at the root of the organ, which it unites to the symphysis pubis. It consists of a dense, cellular, elongated, and flattened band, proceeding from the front of the symphysis pubis, running along the cellular tissue of the organ, and expanded under the skin. Its limits and figure are not very determined, and the knife of the dissector often influences its size and appearance.

The prepuce or fore-skin is a loose fold of the cutaneous covering of the penis, continued over the glans, without adhering to it, and affording a more or less complete covering to the extremity of the penis. Its length varies in different individuals; sometimes it is produced considerably in front of the glans, and its opening is then generally small. Its external surface offers the same structure and appearance as the integuments covering the body of the penis, and is smooth or wrinkled, according to the state of the organ. The inner surface, much softer to the touch, is in contact with the glans, to which it has a membranous attachment below, termed the frenum. The latter is continuous, on one side, with the internal membrane of the prepuce, and fixed, on the other, to the small longitudinal groove which we have described in the under part of the glans; and it ends in this situation by a prominent line fixed to the very opening of the urethra. The frenum limits the extent to which the retraction of the prepuce can be carried; but allows the organ either to be brought sufficiently forwards to cover the whole glans, or to be carried backwards far enough to expose its whole surface. In the latter state the frenum is on the stretch, and, if the prepuce be moved forcibly in this direction, it may even be torn, as in coition; this accident is particularly likely to occur, if the shortness of the fold allows only a partial exposure of the glans. Such a disposition of parts rendering the act of copulation painful, might require a section of the frenum. The basis of the prepuce is attached, on the inside, to the base of the glans, behind which it is reflected so as to line the small channel already described in this situation. Its apex forms a large round opening, of a sufficient magnitude, in general, to allow the part to be drawn entirely back behind the glans; and, even where it is more contracted, much larger than the orifice of the urethra. In some cases its opening is so small as not to allow the retraction of the organ, and even to obstruct the flow of urine; this constitutes *phymosis*: in others, it can be withdrawn, but the tightness is so great that it may not be possible to restore it; that is termed *paraphymosis*. It has been asserted of some races in the East that the prepuce is unusually long, and that this structure particularly favours the accumulation of the matter secreted by the glandulæ odoriferæ; so that circumcision has been more especially necessary on that account.

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The integuments of the penis, having arrived at the base of the glans, are continued forwards to its apex, as far as the opening of the prepuce. There they acquire a different organization, are folded back in a contrary direction, and terminate by a firm attachment round the basis of the glans. The two layers, of which the exterior does not differ from the skin of the penis, except in being thinner, are connected by a stratum of very loose cellular substance, perfectly free from fat. The laxity of this cellular matter is so considerable, that, when the prepuce is withdrawn as far as possible, the two component layers are no longer in contact, but separated completely. The surfaces, by which they before adhered, are now applied to the corpora cavernosa, and the integuments of the penis are withdrawn towards the pubes. The prepuce seems designed to protect the glans, and defend it from the effects of contact, and rubbing against external objects. Yet it is not essential to the functions of the organ, that it should possess such a covering, as the destruction of it by circumcision or disease proves. The covering of the glans becomes afterwards thicker and harder, but the peculiar sensibility, excited in the performance of the generative functions, does not seem to be diminished.

The arteries of the male generative organs are chiefly furnished by the trunk of the pudendal; but the prostatic and vesiculæ feminales receive branches also from the vesical arteries. The integuments of the external parts have branches from the perineal artery, and from the vessels of the thigh. The veins of the penis unite, for the most part, into a large trunk at the middle of the upper surface of the organ, which passes under the symphysis pubis, and opens into a large plexus surrounding the prostate and neck of the bladder. These end partly in the hypogastric veins, and partly in the inferior mesenteric. Besides these there are superficial veins in the prepuce and penis, terminating in the saphena and femoral vein. The lymphatics of the penis are divided into superficial and deep-seated. The former arise from the prepuce and integuments, and go to the superficial inguinal glands. The latter, arising from the urethra and corpus cavernosum, enter the pelvis in company with the branches of the pudendal artery, and join the hypogastric plexus. The nerves of the penis are of considerable size, and are derived principally from the 2d, 3d, and 4th sacral pairs.

*Development of the Male generative Organs.*—As the function of generation does not commence until a considerable period after birth, the development of its organs in the human subject follows a law derived from this circumstance. They undergo no remarkable change from birth till the age of puberty, at which time the process of nutrition is carried on in them with great activity. But they may be observed at an early period in the fœtus, where, without having any remarkable predominance over other parts, they are considerably advanced, as if nature, in sketching out the organization, had wished to mark decidedly the distinguishing local traits.

In the fœtal state, we shall describe merely the condition of the testis and spermatic cord, as these are the only parts differing essentially at that time from the state in which they are found in the newly born child. The rest of the generative apparatus undergoes no remarkable changes, until the time of birth, and we shall therefore not notice them until that time.

There is no part in the body which undergoes so remarkable a change in its situation as the testicle: and, if it be interrupted in this process, a particular disease is very commonly occasioned. This organ, which, at its first formation, lies in the abdominal cavity at the inferior margin

of the kidney, surrounded by the intestines, passes in the advanced periods of utero-gestation into the scrotum, and, as the canal through which it descended is shut up, never regains its original situation. At the time of birth, or very soon after, man and most other mammalia have both testicles in the scrotum. This remarkable change was first noticed and described about the middle of the last century, when many celebrated anatomists turned their attention to it, inasmuch that it is difficult to determine with whom the credit of being the first describer rests. The peculiar kind of rupture, called hernia congenita, which takes place when the descent of the testis is not accomplished in the regular manner, was the circumstance which principally led to the discovery, and more minute investigation of the facts. When surgeons began to reason on the causes and seats of ruptures, and the structure of the hernial sac, they naturally turned their attention towards these parts, and soon discovered that kind of the complaint in which the parts occupy the canal formed by the descent of the testis, and to which the name of congenital was given, because the state of parts favouring its occurrence commonly exists at the time of birth. The examination of the origin and peculiarities of this affection, led to a complete elucidation of the whole affair, in a series of excellent publications.

René-Jean de la Garaune, a French surgeon, who wrote a treatise on ruptures in 1726, has the first hint on the subject; he speaks of the intestines and omentum escaping through the same canal at which the testis has passed out. Among the numerous claims, which the great Swiss physiologist possesses, to the gratitude and respect of all medical men, is that of having given the first clear account of this matter. Indeed, there is hardly any part of the subject which has not been discussed and explained in the writings of this great man; and, as the observation of La Garaune is a single and indirect hint, we must assign the honour of the discovery entirely to Haller. (See *Commerce litterar. Norimberg.* 1735, p. 197; 1737, p. 3. *Programma, herniarum observationes aliquot.* Goetting, 1739. *Opuscula pathologica*, Lausanne, 1755.) Soon after these publications, the subject was taken up in England by the Hunters. Dr. W. H. according to his brother's statement, had found both testicles lying in the abdomen in a still-born child of seven or eight months, some years before the publication of Haller's "*Opuscula Pathologica*," and could not explain the matter to his satisfaction. Mr. J. Hunter published a very full and accurate account of the original situation, and of its change in the testis. (See *Medical Commentaries*, p. 1 Lond. 1762. cap. ix.) About the same time the observations of Mr. Pott were made public. The vast practical opportunities enjoyed by this gentleman enabled him to explain all the pathological circumstances connected with the descent of the testis; his knowledge of the anatomy was probably derived from the sources already pointed out. (See account of a peculiar kind of rupture frequently attendant upon new born children, and sometimes met with in adults, London, 1765. *Treatise on the Hydrocæl*, sect. 3. p. 12. *Chirurgical observations and cases relative to ruptures*, sect. 2.) Camper, who united so successfully anatomical and surgical pursuits, investigated this matter with considerable attention, and gave the results of his labours to the public in the *Harlem Transactions*, v. 6. and 7. The works of Neubaur and Lobstein must not be omitted in this enumeration; that of the former is entitled, "*De tunicis vaginalibus testis et funiculi spermatici.*" Giesse, 1767. The dissertation of the latter, "*De hernia congenita, in qua intestinum in contactu testis est,*" Argentorati 1771, contains a very excellent and complete account of the whole matter, both in an anatomical

cal and surgical point of view. In addition to these we have to notice, as containing good descriptions and useful information, the following more modern works. Girard's Appendix adjecta tabulis posthumis et Sanctorini. Palletta nova gubernaculi testis Hunteriani et tunicæ vaginalis anatomica descriptio. Mediolani, 1777. Brugnone de testium in fœtu positu, &c. Wrisberg observationes anatomicae de testiculorum ex abdomine in scrotum defensu, &c. in the Göttingen commentaries for 1778. Vicq d'Azyr recherches sur la structure et la position des testicules, &c. in the Mémoires de l'Académie des Sciences, année 1780. Martin commentarius de herniæ congenitæ ortu, &c. in the Nova Acta Reg. Soc. Scient. Upsal. v. 3. Sandifort icones herniæ congenitæ, Lugd. Bat. 1781, 4to.

Until the approach of birth, the testes of the fœtus are lodged within the cavity of the abdomen, and may therefore be reckoned among the abdominal viscera. They are situated immediately below the kidneys, on the fore-part of the psoæ muscles, and by the side of the rectum, where this intestine is passing down into the cavity of the pelvis; for in the fœtus, the rectum, which is much larger in proportion to the capacity of the pelvis, than in the full-grown subject, lies before the lumbar vertebræ, as well as before the sacrum. Indeed the case is nearly the same with regard to all the contents of the pelvis; that is, their situation is much higher in the fœtus than in the adult; the sigmoid flexure of the colon, part of the rectum, the greatest part of the bladder, the fundus uteri, the Fallopian tubes, &c. being placed in the fœtus above the hollow of the pelvis, in the common or great abdominal cavity. At this time the figure of the gland is much the same as in the adult, and its position is the same as when it is in the scrotum, that is, one end is placed upwards, the other downwards; one flat side is to the right, the other to the left; and one edge is turned backwards, the other forwards. But as the testis is less firmly connected to the surrounding parts, while it is in the loins, its position may vary a little. The most natural seems to be when the anterior edge is turned directly forwards; but the least touch will throw that either to the right side, or to the left, and then the flat side will be turned forwards. It is attached to the psoas muscle all along its posterior edge, except just at its upper extremity. This attachment is formed by the peritoneum, which covers the testis and gives it a smooth surface, in the same manner as it envelops the other loose abdominal viscera. The epididymis lies along the outer and posterior edge of the organ, in the same relative position, which it occupies at a more advanced age. This part is larger in proportion, and adheres behind to the psoas. When the fœtus is very young, the adhesion of the testis and epididymis to the psoas is very narrow, the part is consequently more loose and prominent. As its age advances, the adhesion becomes broader and tighter. The blood-vessels, like those of most parts of the body, commonly arise from the nearest large trunks; viz. from the aorta and cava, or from the emulgents. The nerves too come from the nearest source; that is, from the abdominal plexuses of the intercostal. In respect, therefore, to its supply of nerves and of vessels, this organ may be reckoned an abdominal viscus; and this circumstance of its peculiar situation before birth accounts for its being supplied afterwards from so remote a source.

The vas deferens, instead of running upwards from the lower end of the testis, as it does at a more advanced period of life, goes downwards and inwards in its whole course; it continues, indeed, in the direction of the epididymis. It turns inwards from the lower end of that organ, behind the upper extremity of the gubernaculum, which we shall de-

scribe presently; then it goes over the iliac vessels, and the inside of the psoas muscle, somewhat higher than in the adult, and passes afterwards, in the direction already described, along the bladder. The cremaster muscle turns upward, instead of descending over the pubes, and seems to be lost on the peritoneum near to the testis.

No spermatic cord exists at the time of life we are now considering. The arteries and veins of the testis go behind the peritoneum, connected to it by loose cellular substances, and enter the substance of the organ at its posterior edge, where the peritoneum is reflected over it, just as the vessels of the intestines pass between the laminae of the mesentery or mesocolon. The vas deferens also goes behind the peritoneum from the testis to the bladder.

While it remains in the abdomen, the testis is connected in a very particular manner with the parietes of the cavity, and with the scrotum, at the place where the spermatic vessels pass out. This connection is by means of a substance, which runs down from the lower end of the testis to the scrotum, and which Mr. Hunter named the ligament, or gubernaculum testis, because it connects the organ with the scrotum, and, as he conceived, directs its course in its descent. It has been described also under the names of ligamentum suspensorium, basis, and cylindrus. It is of a pyramidal form; its largest part is placed upwards, and fixed to the lower end of the testis and epididymis, while the lower and slender extremity is lost in the cellular membrane of the scrotum. The upper part of the gubernaculum is within the abdomen, before the psoas, and reaches from the testis to the abdominal muscles. It runs into the scrotum through the same opening that is afterwards occupied by the spermatic vessels, and is there lost. That portion of it which is within the abdomen is covered by the peritoneum, except at its posterior part, which is contiguous to the psoas, and connected with it by the reflected membrane and cellular substance. Its colour is white, and it may be distinguished by this circumstance from the testis, which is of a reddish-grey. The texture is soft, and has a fibrous vascular appearance. "It is covered," says Mr. Hunter, "by the fibres of the cremaster muscle, which is placed immediately behind the peritoneum: this is not easily ascertained in the human subject, but is very evident in other animals, more especially in those whose testicles remain in the cavity of the abdomen after the animal is full grown." He observes again, "that in the human fœtus, while the testis is retained in the cavity of the abdomen, the cremaster is so slender, that I cannot trace it to my own satisfaction, either turning up towards the testis, or turning down towards the scrotum." The peritoneum, which covers the testis and its gubernaculum, is firmly united to the surfaces of those two bodies; but all around, that is, on the kidney, the psoas, the iliacus internus, and the lower part of the abdominal muscles, that membrane adheres very loosely. Where it is continued, or reflected from the abdominal muscles to the ligament of the testis, it passes first downwards a little way, as if passing out of the abdomen, and then upwards, so as to cover more of the ligament than what is within the cavity of the abdomen. At this place the peritoneum is very loose, thin in its substance, and of a tender gelatinous texture; but all around the passage of the ligament it is considerably tighter, thicker, and more firm. When the abdominal muscles are pulled up, so as to tighten or stretch the peritoneum, this membrane remains loose at the passage of the ligament, while it is braced or tight all around; and in that case, the tight part forms a kind of border, or edge, around the loose doubled portion, where the testis is afterwards to pass. If the parts are drawn towards the abdomen, there is no appearance of an aperture, or passage,

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down towards the ferotum: but when the latter and the ligament are drawn downwards, then there is an aperture from the cavity of the abdomen all round the fore-part of the ligament, apparently ready to receive the testis. This aperture becomes larger when the testis descends lower, as if the pyramidal ligament was first drawn down, in order not only to direct, but to make room for the testis, which must follow it. The aperture is sometimes so large that the testis can be pushed into it, as far as the tendon of the external oblique muscle.

From this original situation in the abdomen, the testis moves downwards, at a certain period, to its destined station in the ferotum. Its lower extremity comes into contact with the lower part of the abdominal parietes. At this time, the upper part of the ligament, which hitherto was in the abdomen, has sunk downwards, and lies in the passage from the abdomen to the ferotum, which is afterwards to receive the testis. As the latter passes out, it inverts the gubernaculum, going down behind it: what was the anterior surface of that organ now becomes posterior, and composes the lower and anterior portion of the tunica vaginalis. Mr. Hunter states, that the place where the ligament is most confined, and where the testis meets with most obstruction in its descent, is the ring in the tendon of the external oblique muscle; and, consequently, that where the testes are not in the ferotum, they are more frequently lodged immediately within the tendon of that muscle, than included in the cavity of the abdomen. The testis commonly remains for some time by the side of the penis, and descends only by degrees to the bottom of the ferotum. When it has entirely descended, the ligament is no longer visible.

While the testis is descending, and even when it has passed into the ferotum, it is still covered by the peritoneum, and is connected by its posterior edge exactly in the same manner as when it was within the abdomen. The spermatic vessels run in the same way behind the membrane, the testis is fixed backwards to the parts against which it rests, and is unconnected and loose forwards, as it was when in the abdomen. In its descent the testis brings the peritoneum with it; but the elongation of that membrane, though it resembles, in some circumstances, a common hernial sac, in others is very different. If a person can represent to himself a hernial sac reaching to the bottom of the ferotum, and covered by the cremaster; if he can imagine, further, that the posterior half of the bag covers, and is united with the testis, epididymis, spermatic vessels, and vas deferens, while its anterior half lies loose before all those parts, he will have a perfect idea of the state of the peritoneum and of the testis when it first descends into the ferotum. This gland, therefore, does not fall loose, like the parts protruded in a rupture, into the elongation of the peritoneum; but it slides down from the loins, carrying the peritoneum with it, and both continue to adhere, by cellular membrane, to the parts behind them, as they did in the loins. The ductility of the peritoneum, and the looseness of its connection to the parts surrounding the testis, are circumstances which favour its elongation and descent into the ferotum with the testis.

It is plain, from this description, that the cavity of the bag, or elongation of the peritoneum, which contains the testis in the ferotum, must at first communicate with the general cavity of the abdomen, by an aperture at the abdominal ring. That aperture has exactly the appearance of a common hernial sac: the spermatic vessels and vas deferens lie immediately behind it, and a probe passes readily through it from the general cavity of the abdomen down to the bottom of the ferotum. And if this process of the peritoneum be laid open through its whole length on the fore-part,

it will be plainly seen to be a continuation of the peritoneum; the testis and epididymis will be seen at the lower part of it; and the spermatic vessels and vas deferens may be observed, covered by the posterior part of the bag, in their whole course from the groin to the testis.

Before the testis has quitted the abdomen, the ferotum is small and corrugated, and contains nothing but cellular substance. This is loose, and yielding near the ring, but more dense and close below. Some have described a pouch of peritoneum passing through the ring, and therefore contained in the ferotum, previously to the descent of the testis: but this is not generally correct. There is no such pouch while the gland remains near the kidney. The parts about the ring are surrounded by such a loose and cellular texture, that, by drawing the gubernaculum downwards, the peritoneum is carried with it so as to represent a small cul-de-sac. The testis, too, after it has passed the ring, may be drawn up again into the abdominal cavity, in consequence of this laxity of the surrounding substance.

In the human body then, when the testis has recently come down, it is contained in a membranous bag, formed of an elongation of the peritoneum, and communicating with the abdomen by means of a narrow process, ascending in front of the spermatic cord. The parts remain in this condition throughout life in the quadruped, but in man the communication between the membranous covering of the testis and the abdomen is soon cut off. The upper end of the canal is closed first, and the aperture is obliterated so speedily, that there is seldom any communication in a child born at its full time. The process of contraction is continued downwards, along the cord, to the upper end of the testis, at which it stops. Thus the tunica vaginalis testis, which was in the first instance a production of peritoneum, becomes entirely separated from that membrane; the peritoneal covering of the gland is the reflected tunica vaginalis.

“This contraction and obliteration of the passage seems,” says Mr. Hunter, “to be a peculiar operation of nature, depending upon steady and uniform principles, and not the consequence of inflammation, or of any thing that is accidental: and, therefore, if it is not accomplished at the proper time, the difficulty of bringing about a union of the part is much greater: as in children who have had the sac kept open by a turn of the intestine falling down into the ferotum immediately after the testis.” “The closing of the mouth, and of the neck of the sac, is peculiar to the human species; and we must suppose the final cause to be the prevention of ruptures, to which men are so much more liable than beasts, from their erect state of body.” We feel some hesitation in admitting this reasoning as to the cause of obliteration: at all events, if we should acknowledge it, the frequent occurrence of ruptures must prove that nature accomplishes her end very imperfectly. “What!” says the same physiologist, “is the immediate cause of the descent of the testis from the loins to the ferotum? It is evident that it cannot be the compressed force of respiration, because commonly the testis is in the ferotum before the child has breathed; that is, the effect has been produced before the supposed cause has existed. Is the testis pulled down by the cremaster muscle? I can hardly suppose that it is. Because, if that was the case, I see no reason why it should not take place in the hedge-hog, as well as in other quadrupeds; and if the musculus testis had this power, it could not bring it lower than the ring of the muscle.”

The process, which we have now described, is liable to some variations. In some individuals, the neck of the peritoneal elongation is not obliterated, so that the tunica vaginalis



nalis communicates permanently with the abdomen, as in quadrupeds. Hence, we sometimes see hydroceles particularly in children, where the fluid can be made to pass into the belly by pressure. If a rupture occurs in such individuals, it is contained, together with the testis, in the tunica vaginalis. Sometimes the testes do not descend before birth; when they pass down after this time, a part of the intestine or omentum is liable to descend with them, and is of course contained in the tunica vaginalis. One or both may be retained in the abdomen beyond the usual period. When the natural process has not begun, or has been interrupted before birth, it becomes afterwards very uncertain when the descent will be completed. It takes place most frequently between the years of two and ten, while the person is young and growing, being seldom delayed beyond the age of puberty. However, one or both of these glands may be retained in the abdomen through life. In this case, Mr. Hunter conceives that there is some imperfection in their formation. "I am inclined," says he, "to suspect that the fault originates in the testicles themselves." And again, "when both testicles remain through life in the belly, I believe that they are exceedingly imperfect, and incapable of performing the natural functions of those organs; and this imperfection prevents the disposition for their descent taking place." The writer of this article has seen two cases, where one testis had remained in the abdomen, and where the circumstances ascertained by anatomical examination corroborated the opinion of Mr. Hunter. In one, the body of the gland was not more than half its usual size: the epididymis, which was very imperfect, ran for about an inch behind the sac of a hernia, which had occurred in this individual, and did not join the body of the testis. The other case presented exactly the same appearances. A third instance has come to his knowledge, in which both of the testes remained in the abdomen, but were formed apparently perfect in their structure. In this case, it was understood, that the ordinary functions of the glands had been executed in a healthy manner during the person's life.

The times, at which the changes in position already described take place, are most accurately noted by Wrisberg in the memoir above quoted. He gives a tabular arrangement of his observations on this subject, deduced from very numerous examinations, of which the following account contains the chief particulars. "At the age of one month and three weeks, the testes were close to the kidneys, with the smallest possible interval; the scrotum loose and oedematous. At two months, the testes, exceedingly small, touched the kidneys; the gubernaculum very long, and the scrotum wrinkled and rather hard. Two months and one week, testicles very near the kidneys; spermatic vessels discernible through the peritoneum, like very fine threads; gubernaculum distinct. Three months, testes about the size of hemp-seeds, placed rather further from the kidneys, and at the edge of the pelvis. Three months one week and a half, the scrotum extremely small, and indeed scarcely discernible, so that the penis hung from a slight prominence of the skin. The small intestines coiled together in the upper part of the abdomen, far from the testes. The latter had descended further on the side of the pelvis; the gubernaculum very short. Three months and three weeks, the scrotum small and contracted: the testes more than three lines below the kidneys. Four months, the scrotum very small: the testes deeply placed, with their inferior ends touching the rings. A distinct canal of peritoneum on the left side, leading from the cavity of the abdomen into the scrotum, although the gubernaculum was not yet inverted. Four months and one week, the testes very high, nearly touching the kidneys: the gu-

bernacula long; no canal passing through the ring, which was perfectly closed. Four months and two weeks, the testes near the ring, with a canal of peritoneum on each side, passing to the bottom of the scrotum. Five months and two weeks, both testes in the rings; so that they could not be seen until pressed towards the abdomen, when they appeared readily. Eight months, scrotum well formed, with its surface wrinkled, but empty. The testes had passed the ring, but remained in the neighbourhood of the groin: the right could be easily pushed back into the abdomen through the process of peritoneum, which was still open; but the left could not, as the communication was already closed. Nine months, testes in the bottom of the scrotum; the canal of communication perfectly closed on the left side; it was shut on the right by a soft cellular substance easily yielding to the probe. Nine months, both canals perfectly closed."

From the foregoing facts, the following conclusions may be drawn: 1st. Before the beginning of the sixth month the testis has not passed the ring on either side; but generally remains near the kidney: so that this situation may be depended on as a proof of the immaturity of a fetus. 2dly. Between the beginning of the sixth, and end of the seventh month, they are generally found about the ring; being in some instances above it, in some within the canal, and in others just below. 3dly. The scrotum in the first months, up to the sixth, is small in proportion to the body, sometimes loose, sometimes hard, but always empty, and containing cellular substance instead of the cavity, in which the testis is to be afterwards lodged. A broad and strong fasciculus of fibres (the gubernaculum) is contained in the middle of its cellular substance. 4thly. When the testes have first descended into the scrotum, the canal of peritoneum still opens to the abdomen, so that they can be easily drawn back into the belly, and sink down again. This is generally practicable, in fetuses, between the 7th and 9th months.

The ordinary law of nature on this subject is, that the human subject, born at the expiration of the full term of utero-gestation, has both testicles in the scrotum. Haller's contrary statement. "ut rarissime fetus in lucem edatur, cum testiculis scroto inclusis," (Element. Physiol. vol. 7. p. 413.) has been completely disproved by the testimony of subsequent observers. Whether the canal of communication be generally closed before birth, is a point on which authors are not unanimous. According to Wrisberg, with whom Vicq d'Azyr agrees, this is commonly the case. But the representation of Camper is somewhat different: this anatomist and Lobstein observe, that the obliteration takes place earlier on the left than on the right side. Of 53 newly born children examined by Camper, 23 had the canal open on both sides, 11 on the right side only, and six on the left only. In six it was closed on both sides. In four both testes were contained in the abdomen; and in three only the right.

In the excellent memoir of Wrisberg, already referred to, there is a table of 103 births observed by himself, in which the position of the testes was carefully ascertained. The proportion of premature to mature and perfect births was as 9 to 94, or in round numbers 1 to 10. All the children, whose weight did not exceed 5lbs. came into the world at the beginning of the ninth month, or in the eighth, or even in the seventh month. Three of these had both testes in the scrotum, three in the groins, and three in the abdomen of the children born towards the end of the ninth month, 69 had both testes in the scrotum, 17 one or both in the groin, eight one in the abdomen, and three, whose weights were  $5\frac{1}{2}$ ,  $6\frac{1}{2}$ , and 7lbs. both in the abdomen. In the 12 out of these 103 cases, where one or both testes remained in the abdomen, they were observed to descend on the days mentioned below,

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*etc.*: in one instance it passed down on the day of birth; the descent took place in three subjects on the second day, in an equal number on the third, in two on the fifth, and in one on the twenty-sixth. In the remaining individuals, they had not appeared on the fourth and fifth weeks from the time of birth; and as the children then left the hospital, the time of descent was not known. In three instances, the descent was observed to be accompanied with crying and convulsive motions of the limbs. Both testes had passed into the scrotum of one child, born at the end of seven months, and weighing only  $3\frac{1}{2}$  lbs.; which must be deemed a rare occurrence. They have been seen in the ring in a fetus of four months. Bichat, Anat. Deser. t. 5. p. 234.

The colour of the organ, while in the abdomen, is greyish, and its form elongated. The epididymis is considerably larger in proportion than in the adult, and its head lies considerably above the testis: it is more loosely connected to the body of the gland. The consistence of the testes at this time is soft and pulpy.

The penis, at the time of birth, although small, is well formed, and possesses an elongated prepuce, which completely covers the glans. The integuments of the penis, as well as those of the scrotum, are not distinguished in colour from those of the body in general. The verge of the scrotum are not yet well marked. There is a small quantity of fat in the scrotum, and the fibrous covering, common to the cord and testis, cannot yet be distinguished. The vesiculae feminales, in consequence of the position of the bladder, peculiar to this age, are nearly vertical in their direction, very small and collapsed, and not exhibiting the tubercles on their surface seen in the adult. Internally they contain a mucous fluid.

The corpus cavernosum penis is very short and small, and remarkable for the small proportion of its spongy substance, and the trifling quantity of blood which it contains. The latter circumstance is still more striking after a few years, in consequence of the increased thickness of the fibrous membrane: hence, as erection depends principally on the swelling of the spongy part of the corpus cavernosum, the penis of children, when erected in consequence of some sympathetic excitation, is hardly increased in size, and very little in length. The urethra, in the first years of life, is long; and its direction from the bladder to below the symphysis pubis is more oblique than in the adult. These two circumstances, in the conformation of the urinary canal, arise from the bladder being situated higher in the abdomen, and from the superior aperture of the pelvis being more slanting. The prepuce is elongated, so as to give the penis a pointed termination. Its opening, always very narrow, may be so small as to prevent the discharge of the urine, or to render it impracticable to denude the glans. The latter circumstance constitutes congenital phimosis. The frenum is narrow and reaches to the opening of the urethra.

No great changes are observed in the organs of generation from the time of birth until puberty. Bused with the general organization of man, and particularly attentive to the bringing to perfection the agents by which he communicates with surrounding objects, to the putting in action the springs of his intellectual powers, nature seems, if we may use the expression, to forget the instruments of reproduction, which continue for a time stationary. If, during this long period, these organs undergo no important revolution, they partake slightly in the general growth. Each of them, considered singly, without increasing in any very marked degree, becomes more perfect in its organization, of which the principal traits may be more easily observed some years after birth. But these changes, which take place very gradually, are

trifling when compared with those which happen at puberty.

*Changes in the male Organs at the Time of Puberty.*—In the two or three years immediately preceding this period, the pubes is covered by a slight down, which appears generally before the beard. We may remark also, that its appearance is more constant, and its growth more rapid. In fact, the hair on the generative organs, although it is not completely developed for some years, has gained nearly its full length and thickness, while the beard is still thin and short. At the same time that the hairs appear, the skin of the scrotum and penis loses its whiteness, and becomes more or less brown in conformity with the tint which it possesses in other parts of the body. The scrotum, hitherto contracted, becomes longer; the testicle is removed to a greater distance from the ring, and the spermatic cord proportionally elongated. The penis becomes larger and longer; the frequent erections occasion the prepuce to appear shorter, and the glans to be a little uncovered. The various layers composing the scrotum are complete at this time. The testis is proportionally larger than the vesiculae feminales and penis, as the exercise of the generative functions commences here. The vesiculae feminales are still very small, even in a subject of 14 or 15 years. The canal of the urethra, as well as the other parts of the penis, is considerably increased, as may be seen by observing the stream of urine.

In old men the scrotum is generally soft and pendent, and external impressions are no longer able to bring it into the state of corrugation. The cellular substance which it contains is frequently the seat of watery effusion. The fibrous covering of the testes and cord is dense, thick, and easily demonstrable. The testicle is small, soft, and wasted; but without any remarkable change in its organization: the volume of the epididymis, on the contrary, is equal to what it possessed in the adult. The spermatic cord is rather smaller, unless the veins should be in a dilated state. The vesiculae feminales are collapsed, and the prostate becomes hard: the penis is constantly placid.

*Physiology of the male Organs of Generation.*—We shall describe, in the first place, the fecundating fluid, as it appears when expelled from the body in the act of copulation; and shall then distinguish the various parts of this compound liquor. We shall exhibit the facts which have been ascertained concerning this interesting subject, just as we treat any other part of physiology: we must either use such language as shall be intelligible, or pass over in entire silence every thing which relates to the production and development of the new beings, and the continuation of the species.

The fluid expelled from the urethra of a healthy man, under the influence of the venereal act, is white, inclining perhaps slightly to a blueish cast. But it is not homogeneous, as it contains thicker and more opaque mixed with a more thin and semipellucid matter. The latter is more abundant in proportion as the subject is weaker, and the act more frequently repeated. From this difference in the appearance of its component parts it has been sometimes compared to coagulated milk. It is of a viscid or glutinous nature, and therefore readily entangles air: hence it becomes frothy if rubbed in a mortar. When first discharged, its consistence is about equal to that of a thick cream; but as it cools, the opaque mucilaginous part becomes transparent, and acquires greater consistency. In about twenty minutes after its emission the whole becomes liquid: at this time, too, it is transparent, having deposited a sediment of a whitish matter, resembling a mass of slender rags. The liquefaction is not owing to the absorption of moisture from the air, for it loses instead of acquiring weight during its exposure to the atmosphere;



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nor is it owing to the action of the air, for it takes place equally in close vessels. It has been observed that the thick flaky portion is thrown out first; while the thinner part comes after. It is heavier than any animal fluid, and sinks immediately in water: but a part swims, consisting of white shining filaments, forming a cobweb-like texture, and composing small floating masses. That which sinks in the mucous or pulpy portion, which is the greater part of the whole; but of this little membranous-like flakes are sometimes suspended by air bubbles. These sink to the bottom and disappear on the second day, but the water remains turbid, and contains flocculi and white shining threads. Its odorous properties are very sensible; not irritating but mawkish and unpleasant, like the farina of the Spanish chestnut. In animals it is said to be of a more penetrating nature; so that when absorbed it infects the whole body, and renders the flesh unfit for eating, unless the testes are cut out immediately after the animal's death. (See Buffon, t. 5. p. 121. of the boar.) The taste is at first insipid; yet there is somewhat of pungency in it, which after some little time stimulates and excites a degree of warmth in the mouth.

It converts paper stained with the blossoms of mallows or violets to a green colour, and consequently contains an alkali. It dissolves readily in water, after its spontaneous liquefaction: alcohol or oxymuriatic acid precipitates white flakes from this solution. Acids readily dissolve the semen, and alkalis do not decompose this solution. Lime decomposes ammonia from fresh semen; but after that fluid has remained for some time in a moist and warm atmosphere, lime separates a great quantity from it. Consequently ammonia is formed during the exposure of semen to the air. When oxymuriatic acid is poured into semen, a number of white flakes precipitate, and the acid loses its peculiar odour. These flakes are insoluble in water, and even in acids. If the quantity of acid be sufficient, the semen acquires a yellow colour. Thus it appears that semen contains a mucilaginous substance analogous to that of the tears, which coagulates by absorbing oxygen. Vauquelin obtained six parts of this mucilage from 100 parts of oxygen. When exposed to the air at the temperature of 60°, a pellicle forms gradually, and in three or four days small transparent crystals of phosphate of lime are formed. Afterwards small round masses of the same substance are observed in the pellicle. If the air is moist, crystals of carbonate of soda may be formed. The evaporation does not go on to complete exsiccation, unless in a temperature of 77° with dry air. When all the moisture is evaporated, the semen has lost 0.9 of its weight; the residuum is semi-transparent like horn, and brittle. When kept in moist air, at the temperature of 77°, it acquires a yellow colour, acid taste, and putrid odour. Exposed to heat, it becomes brown, and exhales a yellow fume, having the odour of burnt horn. When the heat is raised the matter swells, becomes black, and gives out a strong odour of ammonia. When the odour of ammonia disappears, if the matter be lixiviated with water, an alkaline solution may be obtained, which, by evaporation, yields crystals of carbonate of soda. If the residuum be incinerated, there will remain only a quantity of white ashes, consisting of phosphate of lime. Thus it appears that semen is composed of the following ingredients:

90	water,
6	mucilage,
3	phosphate of lime,
1	soda.

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The feminal fluid, in its recent state, contains an immense number of animalcula, called sometimes vermiculi spermatici. They have a rounded head, with a gradually tapering tail, not straight, but alternately bent to either side. They are 1000 times smaller than a hair, and 10,000 times more slender than one of the tubuli testis: so that, according to Leeuwenhoeek, 216,000 of them would go in a sphere, equal in diameter to the breadth of a hair. Their length has been estimated at  $\frac{1}{25}$  of an inch. They are found in all quadrupeds, in reptiles, birds, fishes, insects, and even in testaceous animals. Some variations in figure are observed in different animals: but their size is nearly uniform in all. They are no larger in a whale than in a small fish. They are said not to exist in children, nor to be observable after frequent coition, nor in old subjects; but only in healthy and prolific women, so that their presence may perhaps be deemed a criterion of the maturity and perfectness of that fluid. The feminal vermiculi were first observed by a German youth, Lewis Hamme. He shewed living animals in the human semen to Leeuwenhoeek in the year 1677. This indefatigable observer immediately employed himself on the subject, and in the same year sent an account of the phenomenon, with drawings of the vermiculi in the dog and rabbit, to the Royal Society at London. (See Phil. Trans. n. 143.) The communication was received with great applause, the facts were shewn to King Charles II. and admitted by all. At the same time they were examined and described in France, and, as far as the mere demonstration goes, they were universally admitted in the literary world. Nicolas Hartsoeker claimed the discovery, but not till the year 1678. (Essais de Dioptrique, p. 227.)

It has been alleged that these animalcula are not peculiar to the semen, but that they are found in various other animal fluids. Accurate investigation has not substantiated this objection; but, on the contrary, shews that they are peculiar to the feminal fluid. Others have denied that they possessed tails; and Buffon, in particular, represents the facts very differently from Leeuwenhoeek. (Hilloire Nat. Gener. & Partic. t. 2. p. 176 & seq.) his representations being supported by those of Turberville Needham. (Nouvelles Observations Microscopiques, p. 213.) M. De Buffon observed the fluid from the feminal vessels of a dead human body yet warm. It was full of filaments moving about, and branching into many parts. The filaments swelling burst, and many oval corpuscula escaped, which still remained attached to the filament, as by a thread: then they oscillated like a pendulum, and during those oscillations they extended. The corpuscula, at length detached from the filaments, traversed the most fluid part of the semen, along with their filaments, the extreme length of which impeded their motions, and they seemed to him to endeavour to free themselves from it. Having diluted the semen with rain water, the microscopic view was better defined. It clearly appeared that each oval corpuscule had a double motion of oscillation, and of progression. In two or three hours the feminal matter acquired greater fluidity, the filaments disappeared; the number of corpuscula increased; the threads contracted; the oscillations relaxed; and the progressive motion increased. In five or six hours the oval corpuscula, having lost the threads, resembled animals more than ever; not only because their quickness in swimming was greater, but because they directed their course to every quarter. In twelve hours the activity of the corpuscula was great; and some revolved upon their axis; others changed the oval to the globular figure under the observer's eye; some divided and sundered, so that one formed two.

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At the end of one day the number diminished; and, upon the third, none were to be seen. In other semen, which seemed to be entirely filamentous, the ovular corpuscula did not proceed from the filaments; but these, dividing in two, were metamorphosed into corpuscula. They were embarrassed by a thread. The longer it was, the more it impeded their motion; but it gradually contracted, and was at last completely destroyed. The figure of these ovular corpuscula resembled that of those of infusions. They swam with a progressive motion, though, at first, the thread occasioned a simple oscillation. He observed similar phenomena in the feminal fluid of other animals. Sometimes the corpuscula altered their figure; sometimes they divided into two. Buffon conceives that they cannot properly be deemed animals, and he forms of them a particular class, under the term of *organic molecules*, which are particles disseminated through all matter, original, incorruptible, animated, and always active. Nor does he hesitate to confide the formation of the animated universe to those molecules. Subsequent researches have not confirmed these opinions of the French naturalist. That the feminal vermiculi have tails is proved by numerous accurate observers, and is particularly supported by the testimony of Haller. (Elem. Physiol. t. 7. p. 521.) It seems questionable whether Buffon ever saw the real spermatic vermiculi; for the latter live at most only for a few hours after the discharge of the fluid, while those observed by him remained for some days. And his remarks on the whole seem much more applicable to the microscopic animalcula observed in vegetable infusions, as well as in all liquors exposed to the air. This point seems clearly proved by the labours of Spallanzani, who made a vast number of observations on the subject, and set the whole history of the spermatic animalcula in so clear a light, that no doubt can remain on the subject. The general result of his researches tends completely to confirm the original remarks of Leeuwenhoeck. (See his Tracts on the Nature of Animals and Vegetables. Edinb. 8vo. 1799.) He observes that his experiments on fresh human semen presented him with totally different results from those described by Buffon, but as he could not regard Buffon's statements as purely chimerical, he thought the contradiction might be reconciled by shewing that the French naturalist had described animals of a different kind. "I had remarked," says he, "that there is no part of an animal which, when infused, does not give existence to a particular kind of animalcula. They are produced indifferently, by the muscles, brain, nerves, membranes, tendons, veins, and arteries. The same holds good of the blood, serum, milk, chyle, saliva, &c. mixed with water, or even by themselves. I had not yet made experiments upon the human semen for this purpose; but it was most probable, that the putrefaction of this liquid would give existence to particular beings. May not M. de Buffon have confounded these with the feminal vermiculi, and ascribed to the latter the properties and phenomena exhibited by the former? I determined to ascertain this fact by observing what happened successively to the semen, when long preserved in a watch-glass. I made my first experiments on the human feminal fluid. The vermiculi died in three hours and a half, and were precipitated to the bottom of the glass. Upon the sixth day, the feminal fluid began to exhale a fatid and disagreeable odour; but I could perceive no animated being: only, upon taking some drops from the bottom of the glass, I observed the dead bodies of the vermiculi apparently very entire. The seventh and eighth days I saw no change, but the fetor increased. On the ninth I discovered very minute animalcula, their size nearly equalling that of spermatic ver-

miculi; but they had no tail, and greatly resembled most minute spherules. Like animalcula of infusions, they sometimes flopped at little fragments of corrupted semen: sometimes their course was very rapid, retrograde, rising and sinking in the fluid: in a word, they possessed every property of infusion animalcula. They were seen in every stratum of the semen; and those at the bottom put in motion the dead bodies of the feminal vermiculi, which were still entire, and remained for some days longer." Two or three successive generations of these animals were observed, as in the case of other animalcula. When the semen was exposed to a greater degree of heat, they appeared at a more early period, even as soon as twenty-three hours from the removal of the fluid from the dead body. In one instance they were observed to propagate by a spontaneous transverse division of the body. "These facts sufficiently satisfied me that Buffon had erroneously ascribed to the spermatic vermiculi properties belonging only to the animalcula of infusions. Let us, in a few words, collect the circumstances. According to this author, after a certain time, the vermiculi were deprived of their tails. He should have said that the animalcula of infusion came in the place of the vermiculi, which were already dead, and precipitated to the bottom of the liquid. He was arrested by their first appearance: and took them for feminal vermiculi deprived of their tail, which in truth they often very much resemble. When disengaged from the tail, Mr. Buffon adds, they acquire greater activity. This was a necessary consequence of the first mistake. When the infusion animalcula had taken place of the vermiculi, their increased agility could not be unobserved, since the animalcula move with much greater quickness than the vermiculi. This erroneous supposition being admitted, Mr. Buffon had to relate, as he has done, the remainder of the phenomenon. He had to speak of the imaginary changes of the vermiculi, of their division, and their diminution, with the more confidence, as his opinions had to be confirmed by a repetition of his experiments, if not upon all, at least upon many species of infusion animalcula in the semen." p. 135--142. The following account of the spermatic vermiculi is taken from the work of Spallanzani already quoted, which contains the most complete account of the subject.

When the semen begins to dissolve, if it be examined with a magnifier of small power, the irregular parts seem to be in an indistinct slow agitation, produced by globular corpuscula, of which each possesses a sort of filament, or short appendage, about six times the length of the body. They have two motions; one oscillatory, from right to left, and *vice versa*, in which the appendage is curved from one side to the other: the other is progressive, the vermiculus transporting itself by oscillation. They strike against every obstacle, and when in considerable numbers, make a thousand contortions to escape, at last taking that way where they feel the least resistance. Thus they are in continual motion. In twenty-three minutes the motions of oscillation and progression had diminished; and in an hour and a half it had lessened so much, that a very small number of corpuscula possessed any power of motion. In general, the progressive motion ceases before the oscillatory; so that, at last, the corpuscle merely bends from right to left, and reciprocally. They continue fixed to the same spot, until the oscillatory motion insensibly dies away. After all motion is gone, the corpuscula remain entire in the fluid, and then they are better seen than even when the liquid is diluted with water. Each corpuscle is not properly globular, but elliptic, and the appendage is not only longer than it appears, but the breadth is not equal throughout like a thread, but increases

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as it approaches the body. Water or other fluids rendered them immediately motions. They may be sometimes observed, in the clots of the semen, before they have dissolved, attached by their appendages to the filamentous matter: they struggle to disengage themselves, and then swim about in the fluid. The motion continues much longer when the temperature of the atmosphere is increased: at 36° all motion had ceased in three quarters of an hour: at 49° in two hours; at 59 in three hours and a half: and at 81° they lived for seven or eight hours. The corpuscles were seen in the fluid obtained from the epididymis and testicles of various living and recently dead animals. That they are not formed, according to the sentiment of Buffon, from the filamentous part of the semen, is proved by this; that they are most abundant in the fluid part, and even do not exist at all in the clots, where they are examined in a very recent state, and freed as much as possible from the thinner part of the seminal fluid; while the latter, at the same time, abounds with them. Nor are they generated, as Needham asserted, by exposure to air. For Spallanzani saw them in the usual numbers, when the time employed in taking the fluid matter from the seminal vessels still warm, to present it to the microscope, did not exceed a second; and they were observed in the same numbers in seminal fluid carried without delay from the epididymis of a living ram to the microscope.

Great care and attention are necessary in observing the appendages of these vermiculi, and hence they escaped the notice of Buffon. It is wonderfully slender, and at the same time transparent, so that too strong a light confounds it with the seminal fluid: the slider should be fine and thin, and the drop of fluid very thin: and a microscope of a single lens is preferable to the compound one.

They live longer in close vessels, than when the semen is exposed to the air: and they also live longer in vacuo. The difference of time at which they die in these different situations amounts even to one, two, or three hours. "These facts prove that the air is noxious to the vermiculi, and the following prove that it is the cause of their being in continual agitation. With the blow-pipe I formed capillary tubes, one end of which I immersed in recent semen; it ascended the cavity, filling the tube to a certain height. Breaking the tubes near the part to which it ascended, I presented this extremity to the blow-pipe, and immediately sealed it hermetically. I did the same to the other end, by which means the seminal fluid was deprived of all communication with the external air. I drew out the tubes, so that the thinness of the tubes permitted me to see the vermiculi within. The peculiarities presented by the vermiculi in the tubes were very different from those of the rest. All, or at least most of them, had a singular mode of moving. Some had that sort of activity observed in those, which experience the influence of the open air. Others had a continued irregular motion; they changed from quickness to inactivity, and reciprocally. Others stopped entirely, and, after resting some minutes, resumed their former velocity; besides, they were not observed to run against the solid portions of the semen, but to avoid them by turning aside or retreating. These peculiarities always succeeded better, and with more uniformity, when the tubes were kept warm. I have before said that the longest period of life, of the human spermatic vermiculi, was seven or eight hours, when exposed to the open air, but this period is greatly prolonged when they are included in tubes. In summer I have succeeded in preserving them two days or more; and in spring and autumn they have lived almost three." P. 158.

Cold, near to that of freezing, renders the vermiculi motionless; but they are recovered by the application of heat.

A temperature of 131° kills them; but the animalcula produced in the semen by putrefaction are destroyed by a temperature of 108°.

To this account of the feminal vermiculi we subjoin the following reflections on them by Bonnet, observing only that we are in a state of the most profound ignorance of all the points alluded to in his questions.

"The vermiculi are, of all the animalcula of liquids, those which have most excited my curiosity; the element in which they live, the place of their abode, their figure, motion, fecund properties, all, in a word, should interest us in so singular a kind of minute animated beings. How are they found there, how are they propagated, how are they developed, how are they fed, and what is their motion? What becomes of them when the liquid they inhabit is returned by the vessels, and mixed with the blood? Why do they appear only at the age of puberty; where did they exist before this period? Do they serve no purpose but to people that fluid, where they are so largely scattered? How far are we from being able to answer any of these questions!" Spallanzani's Tracts, p. 179. The reader may also consult, on this subject, W. F. von Gleichen über die Saamen-unk infusions-thierchen, Norimb. 1778, 4to.

The opinions of Leeuwenhoek concerning these vermiculi; viz. that they are of different sexes, that they copulate, become impregnated and produce young; and that they are the rudiments of the future beings, to be conveyed by copulation into the body of the mother, and there developed; are destitute of all proof, and completely chimerical.

We have no accurate accounts of the sensible properties, nor any chemical history of the fluid separated in the testis. When observed in the vas deferens or epididymis of man, after death, it possesses a light-brown or yellowish colour, and approaches in fluidity to water. It may be seen in animals, on cutting into the testis or epididymis, much thicker, viscous, and of a grey colour. At least it has this appearance in a dog. The whole gland, in a healthy animal, is turgid with this fluid. The contents of the vesiculæ feminales differ in their appearance from the secretion of the testicles. It is a brownish or yellowish fluid of light colour, semi-transparent, and often containing flakes or coagula, so as to vary in consistence in different parts of the bag. Exposure to the air produces no change in its consistence, as it does in the semen. Sometimes the contents of these bags are a clear mucous fluid. Mr. Hunter took the trouble of observing them, in two healthy persons killed suddenly, immediately after death. In one the fluid in the vesiculæ was of a lighter colour than is usually found in men who have been dead a considerable time; but it was not by any means like the semen either in colour or smell." In the other "the contents of the vesiculæ were of a lightish whey colour, having nothing of the smell of semen; and in so fluid a state, as to run out on cutting into them." (Obs. on the animal Economy, p. 28.) Thus it appears that the fluid of these bags differs both from that contained in the testis, and from the semen emitted in coition; consequently, that they are not merely reservoirs for the matters separated in the testicle, but that they add to the secretion of that gland some considerable bulk of fluid, separated by their own vessels. The peculiar organization of their internal surface would have led us à priori to expect this, as it exhibits an arrangement of parts found only where some secretion is performed. The same argument will lead us to assign a similar function to the enlarged portion of the vas deferens lying by the side of the vesicula feminalis. The exact nature of the fluid separated in the vesiculæ

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is not known; nor have we any chemical analysis of it. In many instances it looks like a simple mucus; and there can be very little doubt, that in all cases the contents of these bags consist chiefly of their own secretions.

The opinion, that the vesiculæ perform a particular secretion, was held by Haller: "I have," says he, "no experiments of my own to prove that any thing is separated in these organs, and mixed with the fluid formed in the testes. I suspect, however, that a secretion takes place here as in the gall-bladder." (*Flem. Physiol.* 7. p. 540.) Galen conceived that the semen was generated in these parts; and Riouan, Ruysch, and Swammerdam, were of opinion that they added something to the femal fluid. The point has been most clearly proved by Mr. Hunter in a paper contained in his *Observations on the Animal Economy*, and entitled "Observations on the Glands situated between the Rectum and Bladder, and called Vesiculæ feminales." His chief argument is derived from the examination of the organs in persons who have lost one of the testes by accident, or in consequence of disease. It is well known that this loss does not affect the generative powers, and that such individuals retain their sexual appetites and the faculty of procreation. We may consequently presume that they have afterwards had connection with women, and consequently had the action of emission, which must have emptied the vesicula of the castrated side, if it had contained semen; and, as the removal of the testis must have cut off all source of supply from that quarter, it should be found empty after death, on the supposition of its contents being ordinarily derived from the testis. Such cases also afford an opportunity of making comparative observations between the vesicula of the perfect and that of the imperfect side.

"A man," says Mr. H., "who was under my care in St. George's hospital for a venereal complaint, died there, and was discovered to have lost his right testicle. From the cicatrix being hardly observable, it must have been removed some considerable time before his death; and the complaint, for which he was received into the hospital, is a convincing proof that he had connection with woman after that period. I inspected the body in the presence of Mr. Hodges, the house surgeon, and several of the pupils of the hospital. Upon dissecting out, and examining the contents of the pelvis, with the penis and scrotum, I found that the vas deferens of the right side was smaller and firmer in its texture than the other, especially at that end next to the abdominal ring, near to the part that had been cut through in the operation. The cellular membrane surrounding the duct on the right side was not so loose as on the left; neither were the vessels which ramified on the right vesicula so full of blood. But upon opening the vesiculæ, both appeared to be filled with a kind of mucus similar to that which is found in other dead bodies; and the vesicula on the right side was rather larger than that on the left. Whatever, therefore, may be the real use of these vesiculæ, we have a proof from this dissection, that in the human subject they do not contain the semen.

"In a man who died in St. George's hospital with a very large bubonocoele, the testicle of that side was discovered to have almost lost its natural texture from the pressure of the hernial sac; and upon examining the testicle with attention, there was no appearance of vas deferens till we came near the bladder, where it was almost as large as usual. The vesicula of that side was found to be as full as the other, and to contain the same kind of mucus.

"I extirpated the left testicle of a Frenchman on account of its being diseased. He was a married man, and died about a year afterwards, having been extremely ill for several

months before his death. On examining the body, the vesiculæ were both found nearly full; more especially that of the left side, which I suppose might be accidental. But upon examining the vas deferens of the left side, where it lies along the side of this bag, and where it has a similar structure with the vesiculæ, I found it filled with the same kind of mucus; and this, I believe, is always the case, whether the testicle has been removed or not.

"A young man, a coachman, who had a disease in his left testicle, had it removed, at St. George's hospital, by Mr. Walker, in August 1785; and in February 1786 he returned again to the hospital, on account of uncommon pains all over him, and for which he requested to be put into the warm bath. But as he was going from the ward to the bath, he dropped down, and died almost immediately. The body was inspected, with a view to discover the cause of his death, and upon an examination of the vesiculæ, the bag of the left side was as full as that on the right, and the contents in both were exactly similar.

"In dissecting a male subject, in the year 1755, for a side view of the contents of the pelvis, I found a bag on the left side, lying contiguous to the peritoneum, just on the side of the pelvis, where the internal iliac vessels divide above the angle of reflection of the peritoneum at the union of the bladder and rectum. The left vas deferens was seen passing on to the bag; and, what is very singular, that of the right or opposite side crossed the bladder near its union with the rectum to join it. I traced the left vas deferens down to the testicle; but on following the right through the ring of the external oblique muscle, I discovered that it terminated at once, about an inch from its passage out of the abdomen, in a blunt point, which was impervious. On examining the spermatic cord from this point to the testicle, I could discover no vas deferens, but by beginning at the testicle, and tracing the epididymis from its origin about half way along, where it lies upon the body of the testicle, I found that it at first became straight, and soon after seemed to terminate in a point. The canal at this part was so large as to allow of being filled with quicksilver, which however did not pass far, so that a portion of the epididymis was wanting; and the vas deferens for nearly the whole length of the spermatic cord of the right side. On the left side the vas deferens began where the epididymis commonly terminates; and there was a deficiency of nearly an inch of the extremity of the epididymis. I then dissected the bag above-mentioned, which proved to be the two vesiculæ; for by blowing air from one vas deferens I could only inflate half of it; and from the other vas deferens, the other half. They contained the mucus commonly found in these bags; but upon the most accurate examination I could discover no duct leading from them to the prostate gland, nor any remains of one. In this subject it was evident that there was no communication between the vas deferens and epididymis; nor between these bags and the urethra. The caput gallinaginis had the common appearance, but there were no orifices to be seen. The testicles were very found; and the ducts from them to the epididymis were very manifest, and full of semen." P. 30—32.

Mr. Hunter observes further, in support of his opinion, that these bags are as full of mucus in bodies much emaciated, where the person has died from a lingering disease, as in strong robust bodies where death has happened from violence or acute diseases; and they are nearly as full in the old as in the young; which most probably would not be the case if they contained semen." *Ibid.* p. 33.

The secretion of the prostate is the last ingredient in the seminal fluid; and it contributes very largely to the bulk of what

what is expelled in copulation. Its opaque whiteness and viscidly completely obscure the properties of the fluid secreted in the testis, and below on the seminal liquor its most obvious characters. The opinion which supposes that the semen is formed, or that part of it is produced in the prostate, is not therefore so very far from the truth. A thick, white, and opaque liquor may be expressed in considerable abundance from the prostatic ducts on each side of the caput gallinaginis after death. Physiologists ascribe to the prostatic fluid the office of increasing the bulk of the semen, and of thereby augmenting its impetus, so that it may arrive with greater force at the place of its destination.

It has been conjectured that a nervous fluid is mixed with the semen, and hence the weakness of the male after copulation has been explained. We may be excused from discussing this opinion until we know what nervous fluid is. The convulsive exertion of the whole frame, which occurs in the venereal organs, will sufficiently account for the sense of fatigue that follows it.

It appears from what we have said, that the fluid expelled in copulation is furnished in a small proportion only by the testes; that a peculiar secretion of the vesiculae seminales is added to this, and that the chief bulk is made up of the prostatic liquor. An important question arises here, which of these is the essential and immediate agent in impregnation? The general practice in the East, continued from ages of the most remote antiquity, of entrusting their females to the care of eunuchs, and the common operation of gelding, as performed on various domestic animals, lead us to assign this prerogative to the fluid secreted in the testis. In emasculating animals, or men, the testes are cut or torn out, or they are compressed so as to destroy their organization, or the cord is so squeezed or bruised as to annihilate the functions of the part. Yet, under the circumstances just enumerated, we read of numerous examples where venereal desires have been experienced, where erection, copulation, and emission have taken place, and even where children have been begotten. These examples, however, are too repugnant to the general effect of castration, as observable in man and animals, to allow of our admitting them. Ordinarily we observe not only that no desires are felt, but also that the loss of the organs, in which the natural and leading stimulus resides, occasions the other parts concerned in the business of generation to be much diminished in size, and altered in appearance. Where emasculation has been performed merely by compressing the cord or testis, the organization of the part may not have been destroyed sufficiently to interrupt its functions, and such an animal might be still capable of fecundating; but no well authenticated instance can be produced of impregnation being effected where the testes had been cut out in any male animal. Yet it cannot be doubted that eunuchs may have erections, since the seat of the physical feeling is in the glands, and the whole apparatus concerned in erection remains entire after the loss of the testes. A man, after the latter occurrence, like one who has lost his powers through age, may at times be stimulated by the recollection of past joys. Hence, in the East they value those eunuchs most highly, in whom the penis as well as the testes has been removed; no cause for the slightest jealousy can then remain. The prostatic liquor, or that of the vesiculae seminales, might be discharged in the eunuch. If an animal has impregnated another after castration, there may have been some semen remaining in the vesiculae seminales.

Besides the facts now enumerated, we may observe that all animals which copulate have testes; but that several have either no prostate or no vesiculae.

The secreted semen is either expelled from the body, ful-

filling the purposes of its formation; or it is retained in its receptacles, and taken up by the absorbents. The seminal vessels are always full of their peculiar fluids, which are only discharged at considerable intervals, and often only at periods of some months or years. As the testis and vesiculae seminales possess numerous absorbents, we cannot doubt that the contained fluids are conveyed by these vessels into the general circulation. It has been a general opinion that this absorption produces many of the changes which are well known to take place at puberty; and which obviously depend, as we have already shown, on the testes. We refer to a former part of the article on this subject. The males of animals, when the rutting season approaches, have their whole bodies penetrated by a singular setor, so that they are unfit for food. The flesh at this time putrefies more rapidly than at other seasons in the stag. That absorbed semen is the cause of this setor, is rendered probable by the fact, that the removal of the testes destroys it; and by its absence from castrated animals of the same species. The same cause has been assigned for the phenomena consequent on conception in the female; but this seems very doubtful. This absorbed semen has been supposed by physiologists to act as a stimulus on the heart, and the organs of motion, to increase the muscular strength, and to contribute thereby to health of body and strength of mind. Hence, too, they have explained the softness and insipidity of the flesh observed in some animals after the copulating season; as, for instance, in the boar. The flesh of the salmon is remarkably changed in colour and flavour at this time. Castration produces debilitating effects both on the body and mind of man and animals; the ferocious and powerful bull is changed into the mild and patient ox. The influence of the same process in mankind has been already noticed; and we have sufficiently proved that the remarkable development of the frame at the time of puberty arises entirely from the influence of the testicles. And it is no less true that the rest of the sexual organs are particularly affected by the presence and activity of the testes. In this country we have little or no opportunities of observing in eunuchs the effect of the mutilation on the other organs of generation; but we can see the consequences in animals. In Mr. Hunter's opinion, the penis, urethra, and all parts connected with them, are so subservient to the testicles, that he conceives that few of them would have existed if there had been no testicles in the original construction of the body; these parts would then have been so formed as to assist merely in the expulsion of the urine. To illustrate this opinion, let us observe what is the difference between these parts in the perfect male, and in a male that has been deprived of the testicles when very young, at an age when they have had no such influence on the animal economy as to affect the growth of the other parts. In the perfect male the penis is large; the corpora cavernosa being capable of dilatation. The corpus spongiosum is very vascular; and that part of the canal which is called the bulb is considerably enlarged, forming a cavity; the muscles acceleratores urinæ, as they are called, are strong and healthy. In many animals which have long penises, they are continued forwards to the end of it, and in others they are not extended so far, but are very large. On the contrary, in the castrated animal, the penis is small and not capable of much dilatation; the corpus spongiosum is less vascular; the cavity at the bulb is a little larger than the canal of the urethra; and the muscles are white, small, and have a ligamentous appearance. The same observations are true, if applied to the erector penis. The penis of the perfect male is of sufficient length, when erected, to reach to the farther end of the vagina of the female. In the castrated animal it

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is much shorter; and erections having thus become unnecessary, the parts which should project often adhere to the inside of the prepuce. The prostate, Cowper's glands, and the glands along the urethra, of which the lacunæ are the excretory ducts, in the perfect male, are large and pulpy, secreting a considerable quantity of a slimy mucus, which is salt to the taste, is moist probably for the purpose of lubricating those parts, and is only thrown out when the animal is in vigour for copulation; while in the castrated animal they are small, flabby, tough, and ligamentous, and have little secretion." *Animal Economy*, p. 39.

It must be acknowledged that we have no very direct proof that any actual absorption of semen takes place from the testicles or vesiculae, and some physiologists deny it altogether. "I very much doubt," says Blumenbach, "whether real semen be ever absorbed from its vesicular reservoirs in a healthy man;—still more of what has been occasionally asserted, that it is immediately conveyed into the neighbouring veins: and most of all, that such absorption (supposing its existence to be granted) should be considered as a provision against premature venereal stimuli. On the contrary, if we compare the phenomena observed in animals, the impetuous irresistible nature of their desires at particular seasons of the year, with the constitution of such as are castrated, we shall rather deem such absorption the cause of that ungovernable and almost furious appetite. I conceive that a very different means (peculiar, as far as I know, to the human subject) has been adopted to answer the purpose just alluded to; *viz.* nocturnal emissions, which I refer to the natural excretions of man, inasmuch as their more rare or frequent occurrence, according to varieties of temperament and constitution, serves to liberate him from the troublesome and inconvenient consequences of an abundant feminal secretion. It may be readily granted that barbarous nations, of a phlegmatic temperament, and practising irregular sexual intercourse, do not require such an excretion; yet, I think it must be deemed a very natural and suitable relief in a young unmarried man, of a sanguine temperament, plethoric habit, lively and warm imagination, particularly if he indulges in a luxurious mode of life and enjoys perfect health. See Chr. Rud. Jaenisch de pollutione nocturna. Götting. 1795, 4to. Institut. Phylol. sect. 36.

The length of course, and the small diameter of the spermatic artery, together with the impossibility of forcing any injected fluid from its branches into the secretory tubes of the testicle, have led physiologists to conclude that the secretion of the feminal fluid is performed very slowly. But various circumstances are capable of accelerating this process. "Princeps est amor;" says Haller, *Elem. Phylol.* 7. 551. "Nemo forte fuerit, quin in juventute sua feminam concupiverit; quin si casta fuit, in ejus familiaritate ignes conceperit occultos: quin senserit cum dolore et incommodo sibi testes intumescere, et vasa feminalia; dolore certe tanto, ut vix tangere possent eam regionem, vix incedere. Manifesto in hoc malo accelerata est secretio seminis, ejusque liquoris major penus testem distendit. Id mali genus ex reddita tranquillitate animi, et absentia amote feminae sedatur; et celerius etiam sanatur fruitione cupitæ puellæ, et si neutrum remedium accesserit in difficiles tumores abire poterit. Quare in universum, ut plurimum ad movendam venerem irritamenta faciunt desideratæ feminae, aut imagines aspectu lubricæ, aut alia quæcumque, quæ per legem associationis idearum voluptatis memoriam renovant; ita absentia ejusmodi stimuli, et cogitationes perpetuo ad alia avertæ, ipsaque religio, ita minuunt feminis generationem, ut multo minori copia gignatur, neque molestum sit, et demum vasa feminis pene coalescent, et genitalium moles ipsa diminuat." A healthy and

strong state of the animal, nutritious and perhaps rather generous food, and a certain warmth of the weather, promote the feminal secretion. All these circumstances dispose the organs for action, when the natural feelings are duly excited; and the opposite causes, as infirm health, fatigue, insufficient or bad food, and considerable cold, prevent the feelings or dispositions necessary for the action of the generative organs from taking place. The reproductive function is so much influenced by the season in animals, that it is only carried on at a particular time of the year; and the leading organs (the testicles) are reduced in many instances to a very small size in the winter. But in man, and in such domesticated animals as are not in a state of nature, no such change takes place in the testicles; they are consequently always in good condition, and in that state to which other animals that are left to themselves, can only attain in the warmer season.

That the semen, secreted in the serpentine tubuli of the testis, is conveyed from them into the epididymis, and thence into the vas deferens, is sufficiently obvious from the anatomical structure. De Graaf proved it still further, by tying the vas deferens of a dog before copulation: all the secreting tubes were distended to the utmost, and the testis considerably swollen.

We cannot doubt that the secretory vessels of the testis propel their contents by some contractile power; although the precise manner in which this is effected escapes our observation. Does the elevation of the testis to the ring, by the action of the cremaster, constantly observed to accompany emission, promote the progress of the secreted fluid? The immense length and numerous turns of the feminal tubes must render the passage of this fluid from its first secretion very slow; hence, when the supply contained in the vesiculæ is entirely exhausted, an intermission of some time is necessary for the reproduction of a sufficient supply; hence too, in the dog, where there are no vesiculæ, the act of copulation is unusually prolonged.

It has been generally considered that the fluid produced in the testes is deposited and retained in the vesiculæ feminales, as in reservoirs, until occasion occurs for its discharge. Mr. Hunter has endeavoured to shew that these bags are not to be regarded in the light of receptacles for the semen, but as destined to perform a peculiar secretion. The common opinion rests on the facts of the very free communication between the vasa deferentia and vesiculæ, on the course which injected fluids take in the dead body, and the extreme minuteness, numerous convolutions, and great length of the feminal tubes, which seem very unfavourable to the production of semen in the sudden way, and at the very short notice at which it must be formed, if we do not suppose it to come from the vesiculæ. We have already detailed the proofs by which it appears that these organs perform a secretion; but none of those facts shew that the contents of the vesiculæ may not consist, in part, of matter formed in the testis. We know that the gall-bladder produces a copious secretion of its own; but that it also receives bile from the hepatic duct through the ductus cysticus. Mr. H. endeavours to adduce a decisive argument from comparative anatomy: he states that in many animals, the parts corresponding to the human vesiculæ feminales have no communication with the vasa deferentia, and moreover, that their structure, in several instances, seems little calculated to make them reservoirs. Where the obvious structure is so different, we are by no means warranted in concluding that the functions are exactly similar. To argue that the semen does not pass into the vesiculæ of man, where the vasa deferentia are so intimately connected to those bags, because the analogous parts are not connected in other animals, is not more reasonable, than it would be to

affirm



affirm that the fluid of the vasa deferentia passes into the vesiculæ in animals, where the two are not connected, because the structure leads us to infer that it does so in man.

Mr. Hunter continues, "we may likewise infer, from what has been said, that the semen is not retained in reservoirs after it is secreted, and kept there till it is used; but that it is secreted at the time, in consequence of certain affections of the mind stimulating the testicles to this action: for we find, that if lascivious ideas are excited in the mind, and the paroxysm is afterwards prevented from coming on, the testicles become painful and swelled from the quantity of semen secreted, and the increased action of the vessels; which pain and swelling are removed immediately upon the paroxysm being brought on and the semen evacuated; but if that does not take place, the action of the vessels is still kept up, and the pain in the testicles will generally continue till the paroxysm and the evacuation of the semen are brought on, which renders the act complete; without which a stop cannot be put to the action of the vessels that produce the secretion, nor the parts be allowed to fall back to their natural state. There is at this time no sensation felt in the situation of the vesiculæ feminales. The pain in the testicles, in consequence of their being filled with semen; and the action being incomplete, is sometimes so considerable as to make it necessary to produce an evacuation of the semen to relieve the patient." *Animal Economy*, p. 33.

We certainly admit with Mr. H. that the vesiculæ feminales of the human subject perform a particular secretion; but we do not conceive him to have succeeded in proving that they are not also reservoirs for the semen.

The opinion, which denies the vesiculæ feminales to be reservoirs for the semen, is defended also by J. A. Chaptal, in the *Journal de Physique*, February 9, 1787, p. 101. Soemmerring has refuted it in the third vol. of *Blumenbach's Medicinische Bibliothek*, p. 87.

The transmission of the semen, from its ducts or vesiculæ, into the urethra, takes place under the influence of a particular state of mind; and its expulsion from the body is effected, in all animals which have a penis, by means of what is called the erection of that organ. In the human subject, this is an increase of volume produced by the distention of the three corpora cavernosa. Among the exciting causes of this process, we may enumerate, in the first place, the presence of a sufficient supply of seminal fluid: when this is present, any additional stimulus easily produces the effect. Hence, we observe, that the venereal powers of animals are the greatest, when their testes are of the largest size; hence, too, we may perhaps explain the erection sometimes observed after a full meal. A second and more powerful excitement is derived from mental causes. "Altera causa," says Haller, "in sano homine est imaginatio, sive cupido veneris, quæ ex quacunq; causa orta, lætione, visa pictura, memoria voluptatis pristinæ, confabulatione, tactu, et aliis causis, in sano homine continuo in erectionem erumpit. Eadem nocturnam illam et solitariam venerem sola absolvit, quæ se natura nimii feminis onere liberat variis, pro varia feminis abundantia, et sensu acriori aut obtusiori, intervallis. Nam pueris facillima, senibus ea venarior est, aut nulla. Soli homini data est, forte quod homo potissimum memoria et imaginatione valeat. Imaginationem solam, non erectionem, sed plenam venerem, etiam in vigilantibus perfectisse adsunt testimonia. Neque potest absque imaginatione excitata unquam hoc opus perfici; ut turpi, neque hætenus adamata in femina venus vix exerceri possit. Inde illæ impotentia ex verecundia, ex imaginaria debilitate, quo fascinum revoco, aut ex odio, quæ quidem species cum relativa potestate conjuncta est. Hinc manifesta iniquitas ejus legis, quæ ex congressu de virilitate mariti judicabat,

quem in exosa uxore, post insanam injuriam passum, in conspectu tot hominum, ferream oporteret esse, ut illi cum impedimentis venerea jura perserviat. Quare in Galli anno, 1677, die 18. mensis Januarii, ridicula lex abolita fuit, cum Marchio de Laughey, a judice post congressum pro impotente damnatus, dissoluto matrimonio, cum alia uxore multos filios generasset." (*Element. Physiol.* 7. 557.) The peculiar odour exhaled from the female organs, particularly at certain seasons, is a very powerful incentive of venereal feelings in the animal kingdom. Haller considers that this cause acts in the human race also. "Propius partes genitales ipsas adficit, et excretionem extorquet, auget et perficit, frictio glandis, et potissimum colliculorum, qui sunt sub oritis urethræ, quocunq; fere modo ea frictio administratur. Sed ea cum voluptate peculiari, summa, pene nimia, conjungitur, agitque iterum manifesto in nervos, ut vel ex acuto sensu glandis conjicere licet." *Elem. Phys. ibid.*

Erection of the penis takes place from various causes, not enumerated under the foregoing heads; and then it has no concern with the expulsion of the seminal fluid. When a person wakes in the morning, with the bladder tolerably full of urine, the organ is commonly erect; but it subsides when the water is evacuated. Striking the nates with a rod is well known to produce erection; and has sometimes been resorted to to rouse dormant passions. Calculus, strangury, and hemorrhoids are sometimes attended with this symptom; which has been occasionally observed also in other affections. It is often particularly troublesome in gonorrhœa; and has been observed many times after death, particularly in those who have been hanged. (See Morgagni de Sed. et Caus. Ep. xix.) Mechanical obstruction to the return of blood from the part will produce erection, and even such a swelling as ends in gangrene, if the obstacle be considerable and long continued. Ligatures, thoughtlessly placed on the penis by children, and the stricture produced by the retracted glands in paraphimosis, come under this description. In the same way dangerous swelling has been produced by drawing a ring over the penis. The effect of intercepting the return of blood is clearly shewn, in an experiment made by Mr. Hunter on the dog. "In April 1760, in the presence of Mr. Blount, I laid bare the penis of a dog, almost through its whole length; traced the two veins that came from the glans (which in this animal makes the largest part of the penis), and separated them from the arteries by dissection, that I might be able to compress them at pleasure, without affecting the arteries. I then compressed the two veins, and found that the glans and large bulb became full and extended; but when I irritated the veins, in order to see if there was any power of contraction in them, which might occasionally stop the return of the blood, no such appearance could be observed." *Animal Economy*, p. 40, note 2.

That erection is produced by blood being sent into the penis faster than it can be returned, and that the increased size of the organ is entirely produced by this sanguineous distention, are points clearly ascertained. The obstacle to its return is so complete, that no mechanical pressure applied to the body of the penis can force the blood on into the veins. The exact mode, in which this object is accomplished, has not, we believe, been as yet ascertained. There certainly is no power capable of directly compressing the veins; and the erector penis in particular, by drawing the organ away from the symphysis pubis, would rather free them from pressure. The accelerator urine, by squeezing the blood forwards from the bulb, may make the front of the corpus spongiosum and glans rather more firm when they are erect, but can produce no effect on the penis in general.

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Neither is the phenomenon at all like those produced by muscular contraction: it is a quiet and gradual increase, and it often lasts for hours. Muscular action is sudden, and not of such long duration. There are other examples of analogous effects, which are totally inexplicable by muscular action. The nipple, when left to itself, like the penis, is soft and flaccid, short, and retracted; when excited by gentle friction, it rises into a cylindrical form, swells, grows red and warm; yet there is nothing like a muscle in the part. The red fleshy organs about the head and neck of some gallinaceous birds undergo a similar process.

It appears, therefore, that the change termed erection, may take place in animal structure, without the assistance of any muscular power; and it is by no means certain, that any muscle is concerned in the particular case now under consideration. All that we can ascertain on the subject is, that the blood is sent into the corpora cavernosa in much greater quantities than it can return. If a mechanical obstacle does not produce that rigid state of the organ, which is created by the immediate action of desire, we conclude, that a more sudden and complete congestion is produced by the latter than by the former cause. We cannot explain how the proportion of blood, which arrives, is thus altered in relation to that which returns, any more than we understand the analogous phenomenon in inflammation. It does not seem possible to ascertain the mechanism of the process by actual observation. The circumstances already mentioned render it probable that the nerves are materially concerned.

Erection varies considerably in its degree. The organ at first swells, but continues soft; it then grows considerably longer, thicker, more firm and warm; and the glands become redder. The corpora cavernosa penis are first distended, and the glands subsequently. In the state of greatest rigidity, it is proved, by ridiculous experiments, that considerable weights can be supported by the organ. The mere act of erection is not attended with those remarkable effects on the frame which accompany emission; it may be repeated or continued for any length of time without any injurious operation on the animal economy: hence, it is much more frequent than the latter act. Under the influence of certain feelings of the most acute kind, excited in the act of copulation, the seminal fluid is expelled from the ejaculatory ducts into the urethra. The pleasurable sensation is raised to its highest pitch, and is attended with a convulsive agitation of the whole frame, before this effect follows. "Maxima certe est in venere convulsio, et late patens tremor, ut femina, cui clitoris titillatur, neque se sustinere possit, neque genua coarctare, ne tremant, et in aliis res in plenam epilepsiam erumpit: nihil audit neque sentit animal in venerea tentigine. Sunt, qui animo in venere inquantur, etiam feminae; sunt non rari, qui in tanto nimis opere perierint. Est autem omnino major maris voluptas, etiam in plerisque animalibus; nam mares, praeter paucos exempla, feminas sequuntur, et nonnumquam pene inebriati si debigunt: est in viris glans, sensus venerei praecipua sedes, multo quam clitoris major, et certe in venere tumidior. Et si aliquis sensus est in ostio uteri interiori, quanto tam in eo pervenit, manifeste tamen mas in egerendo femina in corporibus, quam femina in toto venere, furis agitatur. Quae omnia sapientissimis consiliis ita facta sunt, ut virum robore armatum, amoris dulcedo femina redderet aequiorem. Dammum et cordis vires vehementer incitantur, et pulsus acceleratur, et cor palpitatur, et respiratio laboratur, et eadem, quae in nixu, phaenomena oriuntur." *Element. Physiol.* 7. 567.

After this tumultuous agitation of the whole frame, and when the swelling of the penis and glands has reached its greatest extent, the seminal fluid is thrown into the urethra.

The anus is closed by its sphincter, and it is said that the levatores ani, by their mechanical pressure, squeeze out the contents of the prostate and vesiculae into the urethra. Probably the coats of the vesiculae and vasa deferentia possess some contractile power, by which their evacuation is assisted. The contents of the prostate and vesiculae are collected in the bulb of the urethra, which is enlarged so as to form a kind of reservoir for them; and are expelled with some force, by successive spasmodic contractions of the accelerator urinae. As soon as this is finished, the temporary agitation subsides, the blood returns from the cells of the penis, and that organ regains its original magnitude. A degree of languor follows, proportional to the previous excitation; the palpitation of the heart goes off, the hurried respiration is quieted, and the strength slowly returns. The subsequent weakness is greater, in proportion as the act has been more frequently repeated, and at shorter intervals. In many animals, where the sexual appetites are only exerted at a particular season, and where the powers are exhibited and exercised on a much grander scale than in man, the debilitating influence is very strongly marked. The venereal powers of the human subject certainly appear very limited, when compared to those of most animals: with a due regard to health, he cannot much exceed the limits assigned by Haller. "Homini adeo modicae sunt vires, ut non multo plus, quam bis in septem diebus coire possit, et si forte acri amore percitus, post longam castitatem, femina concupita potitus, aliquoties possit semen emittere. Sed ea neque multum repeti possunt, neque durare." An attention to the dictates of nature will certainly enjoin temperance in these enjoyments. The performance of a function, so necessary to the continuance of the species, has been ensured by the physical pleasure associated with it: but the effects of too frequent repetition produce those serious consequences which the universal and violent influence of the act on our bodies would naturally lead us to expect. Severe nervous affections, impaired mental faculties, and premature death, are the sure concomitants of excessive venereal enjoyments. Whether the convulsive agitation of the body, or the emission, be the most injurious under these circumstances, cannot, perhaps, be decidedly ascertained. "Omnia ista majora et celebriora, et minus medicae manus obtemperatura, evincunt ab illa detestabili juvenum circe, a qua amor abest, et in qua semen, multo quam in natura opere difficilissimum, dicitur. Ab ea enim corruptela impotentia insanabilis supervenit, et feminis fluxus involuntarius perpetuus, obliqua rigiditas, tabes intra triennium funesta, amissa iudicii vis, et omne fere malorum genus, quod votis velis avertere." *Elem. Physiol.* 7. 573.

These circumstances render it very plain that polygamy is not suited to the organization and powers of man; and afford a much stronger argument against the practice, than the alleged superior numbers of females in Eastern countries would be in favour of it, even if the fact were well proved; which we by no means admit. We may collect also, from the foregoing account, that the sexual functions ought not to be exercised, until the growth and strength are complete; and that all attempts at exciting the venereal appetites, before the natural period of their development, must be prejudicial. On this subject we should bear in mind the observation of Tacitus concerning the ancient Germans; "Sera juvenum Venus, coque inexhausta pubertas."

Man is capable of exercising the generative functions through a certain portion only of his life. We have explained that the organs are in a state of very imperfect development during the early periods of his existence. Boys have erections, but they are not produced by those stimuli which act at a more advanced age. In the middle of Europe,



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a secretion of seminal fluid generally takes place about the twelfth or fourteenth year, inasmuch that it is commonly discharged from the effect of dreams. Soon after this time there is a complete capacity of performing the sexual functions; and there is a well-known instance of a prince who begot twins in his 16th year. The approach of puberty is regulated considerably by the climate, and also by manners; in warm countries it comes on earlier than we have mentioned, and later in colder regions. In the higher ranks of society, where the feelings are prematurely and artificially excited, and encouraged by a copious and generous diet, and loose morality, the generative functions may be called into exercise more early, than under the opposite circumstances. As the individual approaches to the 50th year, the venereal susceptibility is considerably diminished. Semen is still secreted, but hardly ever emitted during sleep, even after the longest abstinence. The venereal act is more slowly performed, but is equally efficacious in producing impregnation. From this time the powers are gradually diminished; but a man of 60 may still become a father, although some legislators have chosen to determine otherwise. A longer continued and more powerful irritation is required to produce erection and emission at this age. In rare examples men have been known to retain their powers of propagation even to the age of 100 years; and it is very well authenticated that Thomas Parry married at 120, and performed the duties of a husband until the age of 140. These latter examples must, however, be regarded as deviations from the ordinary course; and we have equally remarkable instances of the generative functions being performed at an unusually early age. Perhaps the most remarkable case of this kind is a boy now living in London, of whom an account is given in the *Medico-Chirurgical Transactions*, vol. i. p. 276, & seq. At the time of birth this child had much long hair on the head, and the sutures of the cranium were perfectly closed. At the end of the first year these changes took place which usually happen at puberty. The penis and testes increased in size, hairs appeared on the pubes, and the tone of the voice was evidently altered. From this time his body grew very rapidly, and the expression of his features, as well as the general organization, had a completely manly character. The prominence of the thyroid cartilage, and the voice, resembled those of a youth of 16. "The pubes and scrotum are covered with black curling hair. The penis and testes are as large as I have seen in some adults. The latter are firm and perfect in their formation, and the cord may be distinctly felt. The usual brown appearance of the integuments of these parts is here to be observed." There has been a secretion of semen from the end of the second year. This account was drawn up when he was three years old. In his "*Anecdotes de Médecine*," Borden mentions three boys who had strong venereal desires between 10 and 11 years of age: the generative organs were unusually large in these individuals, and were fully capable of exercising their ordinary functions at this time. "Ils ne sentaient qu'un plaisir physique de l'amour; ils ne semblaient avoir autre sensation que celle de cette passion; ils se fondaient, pour ainsi dire, en forme; ils tiraient leur caractère individuel de l'organisme féminal."

The most suitable and natural state after the age of puberty, is that of marriage. If the designs of nature are not fulfilled; if, by refusing to satisfy the imperious calls of love, we prevent the excess of vital energy, which soon animates the generative organs, from being carried off in its natural channel, the accumulated irritability of these organs will frequently disturb the whole frame by its reaction. The physical feeling of love, the impulse of reproduction, has generally a

remarkable character of violence and energy in animals. The phenomena of the rutting season shew the effects of this powerful appetite in a much stronger point of view than they are seen in the human subject; as the influence of the passion is here heightened by its being reduced within a short period of time. Great fierceness, impetuous motions, and often even convulsions, are the effects of the new want in many animals. Parrots, canary-birds, and bull-doches, experience attacks apparently of an epileptic kind, when separated from their females. The physical appetite is rarely accompanied with such phenomena in man. With many individuals, the observance of the laws of chastity hardly requires an effort. However, if the influence of the generative organs should predominate so far as to constitute a well-characterized erotic temperament; if an ardent imagination and a forced state of celibacy should strengthen this temperament, its influence on the constitution may be excessive, and cause various kinds of general disorder. Under the influence of such circumstances, a soldier seized and attempted to violate a girl in public at Montpellier. Neither the publicity of the situation, nor the cries of his victim, nor the exclamations and blows of the surrounding persons, could prevail with him to relinquish his attempt, for which he was hanged. (*Borden, Anecdotes de Médecine*.) The unnatural abstinence observed from mistaken notions of religion, has produced very remarkable effects in some cases. An ecclesiastic mentioned by Buffon, in whom the feelings were very strong, fearing he should be tempted to break his vow, cut away the organs. The same author relates the sufferings of another individual during a kind of erotic delirium, which lasted for six months, and seems to have amounted nearly to mental derangement.

*Female Organs of Generation*—Woman contributes more largely than man to the business of reproduction; and the apparatus destined to this function includes the generative organs, properly so called, and the breasts. These isolated parts are appropriated to the execution of a common object, to which each contributes in its own way, and their development is regulated by a common law. They are called into activity at the same epocha, and their respective functions cease, or at least their capacity of fulfilling them ceases at the same time. The close sympathy which connects them has been remarked at all times. The breasts, however, are manifestly dependent on the generative organs; while the former exercise but a very slight influence on the latter. As the male organs are calculated by their formation to convey the prolific fluid, so the female are constructed with a view to its reception; and the two differ completely from each other. Yet there is a considerable resemblance in some parts of the apparatus in both sexes. Thus the clitoris, which is concealed under the pubis in the superior commissure of the labia, resembles the penis in many points; differing from it by having no connection with the urethra, and consequently being imperforate, also in being very small in well-formed individuals. The most convenient arrangement of the subject, for anatomical description, is that in which the organs are divided into the external and internal. The latter include the essential agents of the generative process in the female; viz. the vagina, with the uterus and its appendages. The former consist of a longitudinal slit, placed between the thighs, containing the termination of the urethra and vagina, and certain prominent parts composed chiefly of folds of the integuments.

The external organs, which can be seen without the aid of dissection, are the mons veneris, the vulva or pudendum, the labia, frenulum, fossa navicularis, clitoris, nymphæ, meatus urinarius, and opening of the vagina.

A broad prominence, placed in front of the pubes, and between

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between the groins, is called the mons veneris. At the time of puberty, this part becomes more convex, and is covered with hairs, of which the number, length, and colour, vary in different individuals. These very seldom advance along the middle line of the abdomen, towards the navel, as in man. Their eminence is formed simply by the accumulation of an adipous cellular substance at this particular point, and it consequently varies in size, according to the *embonpoint* of the individual. A longitudinal fissure, or slit-like cavity, extends from the mons veneris, between the thighs, to within an inch of the anus; this is called the vulva, or pudendum, (which names sometimes include, in a more large application, the external organs,) or sinus pudoris. This excavation is larger in women who have had children, than in virgins. The space left between the posterior end of the vulva and the anus, which may be about one inch in length, is the perineum, in which the raphé can hardly be traced. The labia, or *alæ majores*, are two elongated cutaneous eminences, filled with adipous substance, descending from the mons veneris towards the anus, and forming the lateral boundaries of the cavity just mentioned. They have been named, from a comparison with the lips of the mouth; but the fissure between them is vertical, instead of being transverse, as in the other instance. Their length, which is nearly the same in all instances, and may be somewhere between two and three inches, determines the extent of the vulva. Their size and prominence vary according to the general *embonpoint* of the individual. These folds are thicker above than below; their external surface, which corresponds to the upper and inner side of the thighs, is covered with hairs similar to those of the mons veneris, and possesses some sebaceous glands. The internal surface, formed by a mucous membrane, is smooth, soft to the touch, is contiguous to that of the opposite side, and to the nymphæ. In virgins the colour of this surface is red; it acquires afterwards a pale and rather livid cast. The upper edge of the labia is adherent, and continues externally with the integuments, on the inside with the covering of the nymphæ: the inferior margin is unconnected, convex, rounded, and covered with hairs, and exhibits the continuity of the integuments with the mucous membrane. The anterior, or superior extremity, is confounded with the mons veneris: the posterior, growing gradually smaller, ends in a point, and is united with that of the opposite side behind the fossa navicularis. From this union a sharp prominent ridge results, called the commissure of the labia, or frenulum, and in French *la fourchette*. The following parts enter into the composition of the labia; 1st, a continuation of the skin forming their external surface and inferior or convex edge, provided with sebaceous glands, in the secretion of which the distinguishing odour of these parts resides: 2dly, a mucous membrane covering their internal surface, continuous on one side with the integuments, and on the other with the mucous covering belonging to the whole vulva: 3dly, an adipous tissue filling the interval between these layers, and giving to the parts their various degrees of thickness and prominence. The latter texture resembles on the whole that of the mons veneris, with which it is continuous, but it presents, in addition, some membranous laminae descending from the ischium and pubes to the loose edge of the labium. It does not contain so much fat as the mons veneris, and hence, like the scrotum of the male, it is a part in which anasarous depositions are frequently observed.

The labia cover all the other external organs of generation, which, by this means, are constantly moistened with a mucous fluid, preventing the effects of friction, and preserving the acute sensibility of the parts. In the ordinary attitudes of the body, these organs are in a state of mutual contact, and

therefore completely conceal the parts which we are proceeding to describe: they are separate only when the thighs are thrown widely apart; they receive an extraordinary development during parturition, and thereby increase the capacity of the vulva. When the labia are separated, the following parts may be observed in succession from above downwards: 1. The clitoris, which appears as a small tubercle, more or less prominent, separated from the upper commissure of the labia by a small smooth surface: 2. The nymphæ, *alæ minores*, or *petites levres*, arising from the inferior lateral parts of the clitoris, descending and diverging as they descend, and lost on the sides of the opening of the vagina: 3. A triangular surface slightly concave, bounded above by the clitoris, below by the meatus urinarius, on the sides by the nymphæ, and sometimes called *vestibulum*: 4. The meatus urinarius, situated about one inch below the clitoris: 5. The orifice of the vagina, with the hymen, or *caruncula myrtiformes*, placed immediately under the meatus: 6. The fossa navicularis, a small transverse depression, separating the entrance of the vagina from the frenulum: 7. The frenulum, or posterior commissure of the labia; behind which is the perineum. The clitoris occupies the upper part of the vulva, and forms a reddish slightly elevated tubercle, which ordinarily does not exceed the level of the labia. Its figure is obtusely conical, something like that of the end of the penis; this is called the *glans clitoridis*, and is covered by a loose fold of the mucous membrane lining the vulva, and named *preputium clitoridis*. Besides, the difference of its size, the want of a perforation at the extremity, sufficiently distinguishes it from the penis. A small part only of the organ appears on external examination; the larger portion, which is concealed, and can be brought into view only by dissection, lies over the vagina, and under the arch of the pubes, and bears a great analogy to the penis, as it consists of two *crura* or *corpora cavernosa*, with *erector muscles*. These arise from the inner and even posterior surface of the rami of the *ossa innominata*; ascend, approaching to each other, and unite into a small cylindrical body, terminating in an obtuse extremity, called the *glans*. These *crura* are made up of a firm fibrous membrane, confused with the *periosteum*, forming a tube filled with a cellular or spongy substance, into which blood is effused from the arteries, to be again taken up by the veins, as in the penis. There is a complete septum between the two *crura*, so that they are distinct throughout. The spongy substance of the *crura* is more dense than in the penis, and consequently admits of less distention; hence the size of the organ is not greatly increased in the erect state.

The *erector clitoridis* muscle is analogous in every respect to the *erector penis* of the male; its origin, termination, and probably use, are similar, but the size is smaller in proportion to that of the *crus*. It arises from the inner surface of the ischium, ascends and passes forwards, and is implanted in a tendinous form, in the inferior and posterior extremity of the *crus clitoridis*.

The substance of the *glans* is not different from that of the body of the clitoris, as there is no urethra in this organ, and consequently no peculiar *corpus cavernosum*. It is rounded above and slightly bifid below. The loose and folded prepuce covers it above and at the sides, but not below, being attached to the two sides of the slit, by which the part is marked in this situation. A white, friable, sebaceous, and concreting substance, similar to that formed by the *glandula odorifera* of the penis, is deposited under the *preputium clitoridis*.

This secretion, being liable to accumulate, and becoming irritating in warm countries, as is the case with the analogous substance

substance in the male, has given rise to a similar operation of circumcision in girls in several parts of Africa and Asia. Niebuhr enjoyed the very rare opportunity of seeing the pudenda of an Arabian girl, eighteen years of age, who had been circumcised; he drew the parts from the life, and brought the representation home with him. See his *Beschreibung von Arabien*, p. 77. et seq.

The clitoris corresponds above to the arch of the pubes, to which it is fixed by a kind of suspensory ligament; below to the urethra, to which it is united by a loose cellular tissue.

It resembles the penis in its acute sensibility: "sensum mire vehementem est, ut tota crura ab ejus particulæ sollicitatione contremiscant, femineque totæ extra seponantur, nihilque possint proco negare. Quæ extra venerem, in casta femina parva fuerat, sed etiam modo arrigit et intumescit, ut prepotenter veneri inservire possit, multoque usu ejus turpitudinis denique moles ejus augetur, ut omnia membra solent, quibus multum utimur. Quæ causa videtur fuisse, cur orientales populi, accurati castitatis muliebris custodes, hanc particulam in nuper natis puellis amputaverint, aut certe ferro decurtaverint." *Element. Physiol. lib. 28. § 20.* We have made some observations, concerning the occasional increase in size of this part, in the remarks on hermaphrodites.

The nymphæ are two membranous folds, connected above to the preputium clitoridis, and descending about as far as the middle of the aperture of the vagina. They are thin and flattened, broadest in the middle, and narrower at the two extremities. Their external surface corresponds to the inside of the labia, while the internal, approximating above to that of the opposite side, corresponds below to the meatus urinarius and orifice of the vagina. Their adherent edge is tolerably thick; while the loose margin is thin and convex: the latter is sometimes wrinkled or notched, so as to have occasioned a comparison of the part to a cock's comb. The superior extremity arises from the preputium or glans clitoridis: the inferior ends at the side of the vagina. They are smooth and of a red colour in young women, and acquire a darker hue in older subjects, and particularly such as have had children. They are formed of duplicatures of the membrane lining the vulva, filled internally with a cellular substance, free from fat: and they contain sebaceous glands, the excretory ducts of which form very obvious pores: they differ very much in size. Ordinarily, they are completely covered by the labia, when approximated. Sometimes they form scarcely perceptible prominences, while at others they are very large, and hang down between the labia, so as to form an inconvenient obstruction to the sexual functions; in this case their surface is irregular, being grooved and tuberculated. Such formations are more frequent in the inhabitants of warm climates, where it is not unusual to cut off some part of them; and the operation is even occasionally practised in European countries. Frequently one is larger than the other. They possess considerable sensibility. The chief use assigned to them is that of assisting, by their development, the enlargement of the vulva during parturition: the distention of the parts by the passage of the child destroying the fold. The name of nymphæ was given to them from a supposition that they regulate the jet of urine; but as women evacuate this fluid with the thighs apart, and as the direction of the stream seems to depend so entirely on that of the urethra, we cannot adopt this supposition. And we are further confirmed in rejecting the opinion by the existence of these folds in many animals where they can have nothing to do with the stream of urine.

We have nothing further to say concerning the vestibulum, except that the surface is smooth, and that it is terminated below by the opening of the urethra, which is about

three quarters of an inch, or an inch from the clitoris. The description of this canal, and its termination, will be found, together with that of the female bladder, under the article *KIDNEY*.

Immediately under the orifice of the urethra is the entrance of the vagina, called sometimes the os externum uteri; the diameter and appearance of which vary very considerably in different individuals. In virgins this opening is very narrow; it is broader after the sexual act has been performed, and most ample in women who have had many children. The narrowness in the first case arises from the presence of a duplicature of the mucous membrane, called the hymen, which contracts the opening so considerably, that marriage cannot be consummated without its being ruptured; hence, after this laceration, the entrance of the canal is more free. As the parts are vascular and sensible, more or less bleeding and pain generally attend this dilatation of the aperture; and these circumstances are expected in some countries as the necessary proofs of virginity in the bride. However, they do not always attend the first coition; and it should seem, by the following quotation, that the existence of the hymen hangs by a very slender thread; "L'hymen, pendant le premier âge, est très mince, se rompt facilement et se détruit, lorsqu'on effuie avec trop peu de ménagement les parties extérieures de la génération, soit lorsque l'enfant lui-même, avec ou sans intention, contracte des habitudes Lesbienues, prépare et dispose ainsi aux plaisirs solitaire, des organes qui sont à peine ébouchés." *Morceau Hist. de la Femme*, tom. 1. p. 53.

The hymen is a duplicature of the same membrane which lines the entrance of the vagina, and has the same texture and properties. It is soft, red, vascular, and sensible. The posterior surface is reticulated, as the columns of the vagina terminate on it. Its size and figure vary very considerably. Generally it has the shape of a crescent, with the concavity turned upwards or forwards. The convex edge is attached, the concave loose; the former is fixed to the inferior part and sides of the vagina, the latter is turned towards the urethra. The orifice of the vagina, in the virgin, is the space bounded in front or above by the meatus urinarius, below or behind, and at the sides, by the loose concave edge of the hymen. The dimensions of this opening must depend therefore on the breadth of the hymen, which differs much in different individuals: ordinarily, it will admit the little finger without any stretching. This crescented or falci-form figure of the hymen is seen only when the labia are drawn apart, and the sides of the vagina gently stretched; for in the ordinary attitudes, the membrane is thrown into longitudinal folds, the sides of the vagina coming into contact with each other, so that the entrance of the canal is completely shut. However, the space left between the urethra and the edge of the membrane will always allow the escape of the menstrual discharge. The lower part of the hymen is the broadest, and the horns of the crescent, where they advance along the sides of the aperture, grow gradually narrower, until they are completely lost.

Sometimes the hymen is continued under the orifice of the urethra, so as to form a complete membranous circle, perforated in the middle, instead of a crescent. Indeed Haller, and many other very accurate anatomists, have found the fold, when the parts were carefully examined in water, generally continued under the urethra; but very narrow at that part. In more rare cases the hymen is an imperfect circular membrane, attached to the edge of the orifice of the vagina in every part, so as to close the canal completely. Such females have been termed *atrocæ*, by a word derived from the Greek, and signifying imperforate. As there is

no aperture in such cases for the discharge of the menstrual fluid, it accumulates in the uterus and vagina, and must be evacuated by a surgical operation, consisting of a puncture of the hymen. For the various appearances which this part exhibits in different individuals, the reader may consult J. G. F. Tolleng, de varietate hymenium, Hal. 1791, 4to.

It has generally been asserted, that the hymen does not exist in quadrupeds; but the statement of Cuvier, in his *Lçons d'Anat. comparés*, tom. 5, leçon 29, sect. ii. art. 2, renders this point very doubtful. The general opinion of its non-existence in the other mammalia besides man, and the circumstance of its being found in women only, at a particular period of life, and even then not universally, have led many anatomists to deny its existence in the human subject. But the fact is so clearly proved by the concurrent testimonies of all modern anatomists, who have enjoyed considerable opportunities of dissection, that we wonder to find Buffon still contending the point: any of his anatomical friends might surely have convinced him by ocular proof. Though we are fully convinced, by repeated observation, that Buffon's opinion is incorrect in point of fact, we cannot help admiring the eloquence with which he inveighs against the disgraceful opinions and practices which have prevailed on this subject. "Les hommes," says he, "jaloux des primautés en tout genre, ont toujours fait grand cas de tout ce qui ont cru pouvoir posséder exclusivement et les premiers: c'est cette espèce de folie, qui a fait un être réel de la virginité des filles. La virginité, qui est un être moral, une vertu qui ne consiste que dans la pureté du cœur, est devenue un objet physique dont tous les hommes se sont occupés; ils ont établi sur cela des opinions, des usages, des cérémonies, des superstitions, et même des jugemens et des peines; les abus les plus illicites, les coutumes les plus déshonnêtes ont été autorisées; on a soumis à l'examen de matrones ignorantes, et exposé aux yeux de médecins prévenus, les parties les plus secrètes de la nature, sans songer qu'une pareille indécence est un attentat contre la virginité; que c'est la violer que de chercher à la reconnoître; que toute situation honteuse, tout état indécent, dont une fille est obligée de rongir intérieurement, est une vraie défloration. Je n'espère pas réussir à détruire les préjugés ridicules qu'on s'est formés sur ce sujet; les choses, qui font plaisir à croire, seront toujours crues, quelque vaines et quelque déraisonnables qu'elles puissent être; cependant, comme dans une histoire on rapporte non seulement la suite des événemens, et les circonstances des faits, mais aussi l'origine des opinions et des erreurs dominantes, j'ai cru que dans l'histoire de l'homme je ne pourrais me dispenser de parler de l'idole favorite à laquelle il sacrifie, d'examiner quelles peuvent être les raisons de son culte, et de rechercher si la virginité est un être réel, ou si ce n'est qu'une divinité fabuleuse."

It is not so easy to explain the use or purposes of this membrane, as to establish the fact of its existence. The partisans of final causes have been much puzzled in attempting to display the wisdom or goodness of the Creator, as evidenced in this part of our anatomy, and have as yet assigned no rational explanation of it. We subjoin from Haller a statement of the commonly received notions, which, however, appear to ourselves entirely unsatisfactory. "Vix tam dubites, cum scdo in homine sit repertus, etiam ad morales fines ei esse concessum signum pudicitia, quo et vitium illatum cognoscatur, et pura virgo decus suam possit tueri, et ipse maritus de castitate sponse facile convincatur, eo scilicet, quod præterea in liberata virgine vagina angusta sit. Etsi enim possit fieri, ut laxus, ut parvus sit hymen, atque prima venus aliquando absque sanguine absolvatur, neque hymen rumpatur; etsi artificii porro in parva pudica

femina sanguis possit elici; etsi teneræ virgines aliquando etiam in altero coitu sanguinea reddant, et menses fluentes vaginam laxant; tamen in universum debet prima venus cruenta esse, eoque signo pudor virgineus adferri, cum vix possit plena venus obtineri, quin superior margo partis majoris hymenis laceratur. Quare et mores leges, et multorum populorum consuetudo, hoc signum servatæ castitatis et requirant et odentant, et de exemplis in virginibus etiam pene trigemariis certus sum, quæ insignem in prima venere sanguinis jacturam sunt passa." *Elem. Physiol.* lib. 28, sect. 2, §. 27.

After the hymen has been torn, the entrance of the vagina presents some fleshy prominent tubercles, called *carunculae myrtiformes*, and varying in number and size. These are generally considered to be the remains of the lacerated membrane; "et corruptæ adeo pudicitia indicia." The *carunculae* are generally largest at the sides of the vagina, where the hymen is narrowest; so that all these prominences cannot well be referred to the origin just mentioned. Some are found behind the hymen, and exist previously to the laceration of that membrane: these are the prominent, obtuse, and callous apices of the columns of the vagina. Lastly, there are projections at the termination of the mucous ducts, which may be enumerated among these *carunculae*; and warts are sometimes formed in this situation. Whatever their origin may be, we find from two to five or six rounded and firm, or thin and loose prominences, of a red or livid colour, about the entrance of the vagina.

The *frenulum*, or *fourchette*, is a cutaneous fold of a crescent shape, with the concavity upwards, placed behind and below the entrance of the vagina, visible in the virgin state, when the sides of the vulva are drawn apart, but not well marked when the parts are collapsed. It lies between the two labia, not quite at the lower extremities, and is extended almost to the nymphæ, protecting in some degree the entrance of the vagina. It is near to the hymen, which it resembles in some respects. The act of copulation does not injure it, but repeated parturitions entirely efface it. A very manifest transverse cavity, named the *fossa navicularis*, is intercepted between the *frenulum*, the hymen, and the labia; and this cavity is lost of course when the *frenulum* disappears, so that it may not be recognizable in married women.

A mucous membrane, by which the genital and urinary organs are united in the female, is continued over all the parts contained in the vulva, and even forms many of them. It arises on the loose convex edges of the labia, and at their commissures; covers the internal surface of these folds, the space below their anterior commissure, and the *fossa navicularis*, then forms the nymphæ and preputium clitoridis, covers the vestibulum, is continuous with the lining of the urethra, and with that of the vagina, after forming the hymen or *carunculae myrtiformes*. It is connected to the subjacent parts by a copious and loose cellular texture, in which, generally speaking, there is very little fat. Its colour is of a tolerably bright red in young women; but it assumes darker shades in more advanced ages, particularly when the sexual functions have been much exercised. The texture of the integuments changes gradually into this mucous surface, so that there is no abrupt line of distinction, and an epidermis can be distinctly demonstrated at its origin. The colour proves that it is copiously supplied with blood. The membrane is soft on its surface, and plentifully bedewed with a mucous fluid, poured out from small tubes, which commence by open orifices, and run into the substance of the membrane, where they terminate by cul-de-sacs. These, which are called *lacunæ*, are similar to what we have described

scribed in the male urethra, and they have been very minutely investigated by Haller. He describes some small ones, to the number of seven or eight, between the clitoris and urethra; and others considerably larger, on each side of the urethra, admitting a fine probe for the length of some lines. There are also two or three large lacunæ on each side of the vagina, admitting bristles for half an inch or more. Nothing of a glandular structure can be detected about these parts; the lacunæ seem to produce the mucus here as in the male urethra. These parts, together with other lacunæ situated in the urethra, are the sources of the fluid by which the female organs are lubricated: the circumstances, under which it is effused, are thus mentioned by Haller; "mucus, quam femine in venere ardentes profundunt, aut in coitu, aut a turpi frictione, aut demum, nam reperiuntur mulieres ejus nature, ad conspectum formosi amatique juvenis." *Elem. physiol.* lib. 28. p. 88.

This membrane enjoys a high degree of sensibility, and appears in part to be the seat of that peculiar modification of sensation experienced in coition. Its extraordinary dilatation in parturition, and the recovery of its former size, shew that it possesses extensibility and contractility.

Sometimes the labia are united at their convex edges, and the urine escapes by a small opening towards their upper end. The line of separation can be easily recognized in such a case, and a very slight incision is sufficient to bring the parts to their ordinary state. The nymphæ may be similarly circumstanced.

We have mentioned already, that the women of hot countries generally have large nymphæ; it would not be right to pass unnoticed the peculiarity of formation ascribed to the Hottentot women. Travellers have related that the sexual organs are covered, in these females, by a natural kind of apron, *i. e.* by an extension of the skin from the pubes. Ten Rhyne, who had opportunities of personal observation, explains the fact by an unusually large size of the nymphæ (*de promontorio bonæ spei*, p. 33.); but this does not agree with the statement of Le Vaillant, who seems to have taken considerable pains to ascertain the truth. He represents it as an enlargement of the labia, produced by artificial means, from a whimsical notion of beauty. "These organs," says he, "may be extended to the length of nine inches, according to the age of the individual, or the perseverance with which she endeavours to bring to perfection this very singular personal decoration. I saw a young girl, fifteen years old, in whom they were already four inches long. They are brought to that size by rubbing and drawing them, which is the beginning of the process; the affair is completed by suspending weights from the parts. I have said that it is a peculiar taste, a strange kind of whim; in the horde, where I was, there were only four women, and the young girl, whom I have just mentioned, in this ridiculous state." The account given by Messrs. Peron and Lefeur, in a memoir addressed to the national institute, seems to differ somewhat from the statement of Le Vaillant, but this perhaps arises only from the mode of description. They say that the part is an appendage of the labia,  $8\frac{1}{2}$  centimetres in length in an adult, adhering above, where it is narrowest, to the superior commissure of the labia, in front of the clitoris, and divided into two lobes, which, approximated to each other, cover the vulva. It consists of a soft, wrinkled, and very extensible skin, entirely free from hair, rather redder than the rest of the integuments, and susceptible of corrugation, like the scrotum of man." (*Cuvier*, tom. 5. p. 125.) Steller mentions some peculiarity, similar to that of the Hottentots, in the Kamtschatkan women. See his *Beschreibung von Kamtschatkan*, p. 300.

*The internal Organs of Generation.*—The vagina, or canal of the uteri, is a membranous canal, extending with a very slight obliquity from below upwards, and from before backwards, from the vulva to the neck of the uterus. Its anterior position is nearly transverse; the posterior ascends towards the uterus. It lies in the middle of the inferior aperture of the pelvis, between the urethra and bladder, which are in front of it, and the rectum which is behind. The ordinary length of the canal is from five to six inches, and the breadth one inch; but as it is very extensible, these dimensions are subject to change. It is narrower, but at the same time longer in the virgin, than in married women; during parturition its size is equal to that of the child's head; it is very capacious after delivery, so as to be three inches in diameter; but it soon regains its previous size, never however returning to the narrowness of the virgin state. Its form is nearly cylindrical, but somewhat flattened to vary its anterior extremity. It is slightly bent towards the pubes; its two extremities are obliquely truncated, so that the anterior surface is shorter than the posterior. We shall describe in it an external and an internal surface, and two extremities.

The external surface may be divided into an anterior, a posterior, and two lateral regions. The anterior, sloping upwards and slightly concave, corresponds to the bladder and urethra, being connected to the former by a loose cellular texture, and very intimately united with the latter by a dense and firm substance. The posterior region, sloping from above and behind downwards and forwards, is gently convex, and corresponds to the rectum; its superior half, being covered by the peritoneum, is simply contiguous to the intestine; while the inferior part, possessing no such covering, is connected to the intestine by cellular substance. This connecting medium is much looser above than below; and in the latter situation it is difficult to separate the two organs without cutting one or the other. The lateral regions are narrower than the parts just described, and surrounded by much cellular substance. They correspond to the ureters, to the plexus formed by the blood-vessels of the uterus and vagina, and below to the levatores ani. The internal surface of the organ presents a vast number of folds and prominences, which make it irregular throughout. These callous rugosities exhibit a most elegant arrangement in the fetus and in the virgin; they are confused and partially obliterated by parturition, but are very soon restored, and may often be very distinctly observed even in old women. In some subjects, however, the whole vagina is nearly smooth. The half of the canal next to the uterus contains the fewest and least remarkable irregularities; the folds here are soft, mostly transverse, but sometimes partly oblique. These prominences are jagged laminae, ending in a thin edge, turned towards the opening of the vagina, differing in size and variously interwoven with each other. On the anterior half of the canal are raised two prominent columns: an anterior and a posterior one. These are beset with hard and nearly cartilaginous warty prominences, closely arranged, of a roundish figure, and circumscribed by grooves. The anterior column is the largest, and corresponds to the orifice of the urethra. Frequently this is bifid towards the front, and its two portions, joined by transverse rugæ, end in the hymen. The front end of this column sometimes projects like a papilla at the orifice of the vagina. The posterior smaller column is exactly opposite to the anterior, and corresponds to the rectum; sometimes it is hardly distinguishable. This ends also in the hymen, and in some instances projects anteriorly like the anterior column, but less considerably. From each of these columns, hard, cartilaginous, transverse or oblique folds are extended; they project downwards,

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have a jagged edge, and are mixed with verrucæ and other less prominent laminae in various directions. Between the two columns is a reticulated surface, formed from the transverse productions. The use of this structure does not seem very obvious. It may possibly facilitate the dilatation of the organ. "Voluptatem et acrium augere crederes, nisi in uteri cervicis similes valvulae redirent. Arcum tamen eminendo vaginam; et inferior columna parti glandis frenulo vicina occurrit. Sensilem vaginam etiam facere credas, quæ ob has valvulas et ipsa magis conficitur. Insensilem tamen fuisse lego." Haller, *Elem. Physiol.* lib. 28.

All the generative apparatus abounds with mucus, and this moisture is obviously convenient in many of the functions of the part. In the fœtus it appears as a whitish milky kind of fluid; and it is a true mucus in the adult. The fluor aëus and gonorrhœa seem to be merely a diseased state of this secretion. Round livid spots are frequently observed on the smooth part of the vagina, near the uterus; their cause and nature are unknown. Numerous pores are observable among the folds and rugæ of the vagina. Eustachius noticed sinuses in the membrane; *i. e.* tolerably large sinuses, sometimes ramified, and containing mucus. No glands can be discovered in the organ.

The superior extremity of the vagina is united to the inferior part of the neck of the uterus. It embraces the latter organ obliquely, so that the anterior surface of the vagina is nearer to the os uteri, and the posterior is more remote from it; and the cavity between the vagina and the neck of the uterus extends higher behind than before. The inferior extremity occupies the lower and posterior portion of the vulva, in front of the anus, and ends there by the orifice which we have already described. The sides of the vagina possess considerable thickness and strength. The upper half of its posterior surface is covered by peritoneum. The chief substance of the canal is a thick, close, and firm texture of a greyish colour, possessing large vessels, and having fibres in various directions, so as to give it somewhat of a muscular appearance. It appears to be continuous above with the substance of the uterus. Below it is surrounded by a kind of corpus cavernosum, of about an inch in breadth, and two lines in thickness, composed apparently of veins, and called the plexus retiformis. A determination takes place to this part at the time of copulation, and it experiences a kind of swelling analogous to erection. On the whole, the membrane of the vagina is not so thick, as the distention which it experiences in parturition might lead us to expect. Excepting where it is covered by the peritoneum, and by the plexus retiformis, the surface is surrounded by a copious cellular substance, containing many vascular ramifications.

The vital properties of the sides of the vagina are not well understood. Some ascribe to it a contractile power, exercised, as it is said, in coition, and felt by the hand when introduced in the processes of midwifery. The phenomena of parturition show that it possesses in a high degree the powers of extension and subsequent contraction.

The internal surface of the canal is lined by a mucous membrane, to which the peculiar tissue of the vagina already mentioned adheres very closely. It is continuous with the membrane of the vulva; and, after lining the vagina, is extended over that portion of the cervix uteri, which projects into the canal, and communicates, at the os tinea, with the lining of the uterus. This mucous lining forms all the inequalities already described; it is thicker near the vulva, and grows manifestly thinner towards the uterus. At the entrance of the canal it has a red colour, which changes farther into a grey or whitish cast, diversified near the cervix

uteri by the livid spots already mentioned, which give it a marbled appearance. The almost cartilaginous hardness of the membrane in some parts is peculiar to the vagina, as well as the permanent folds in its structure; in other mucous membranes the inequalities are occasioned by some external cause, and disappear by extension. Some anatomists ascribe an epidermis to the vagina; but this point is doubtful. The organs, by which its mucous fluid is secreted, have been already mentioned.

The place of the accelerator urinae of the male subject is occupied in the female by the *sphincter vaginae*, which covers the plexus retiformis. It descends on each side from the body of the clitoris, behind the erecter; surrounds the anterior extremity of the vagina, immediately behind the labium, where it possesses considerable breadth, and terminates below, on each side, in the lateral fibres of the sphincter ani. It must have the power of contracting the front orifice of the vagina.

The arteries of the vagina come from the internal iliac; its vasa join the venous plexus, which surrounds the canal. The lymphatics are not well known; the nerves come from the sacral trunks.

The uterus is the organ in which the fœtus and its coverings are contained until the time of parturition. It is almost always single; in some rare cases there have been two uteri. There is some variety in these instances; either there may be two uteri and two vaginæ; or a single vagina divided by a septum in its whole length, or only in its upper half; or one of the uteri may open into the rectum, and the other into the vagina. In some cases the uterus is divided internally by a longitudinal septum, either confined to the neck, or prolonged to the orifice of the vagina. Sometimes the uterus is altogether deficient. A vast number of references to authors who have related examples of all the above-mentioned unusual formations may be seen in Voigtel's *Pathologische Anatomie*, b. iii. p. 452—456.

This organ is situated in the pelvis, behind the urinary bladder, before the rectum, below the convolutions of the ilium, and above the vagina. Its situation is oblique, the fundus being placed upwards and rather backwards, the neck downwards, and slightly inclined forwards. Two broad folds of peritoneum, named the *ligamenta lata uteri*, fix it to the side of the pelvis. Other ligaments assist in maintaining this viscus in its situation; *viz.* the round, the anterior, and the posterior ligaments.

The broad ligaments extend from the sides of the uterus to the sides of the containing cavity. Together with the uterus they form a complete transverse partition, dividing the pelvis into an anterior and a posterior cavity, of which the former and smallest contains the urinary bladder, the latter and largest, the rectum. These ligaments are flattened from before backwards and quadrilateral. Their two surfaces are smooth, and unattached; the anterior being turned directly forwards, towards the bladder, the posterior directly backwards, towards the rectum. The upper edge is divided into two prominent lines; of which the anterior and highest contains the Fallopian tube, the posterior, the ovary and its ligament. The three other margins are adherent; the inferior, to the lower part of the pelvis; the external, to the side of the cavity; and the internal to the lateral margin of the uterus. These ligaments are formed by two layers of peritoneum, between which are placed the vessels and nerves of the uterus, the ovaria and their ligaments, the Fallopian tubes, and some cellular substance. They fix the uterus in its situation, and give it a covering, in proportion as it increases in size during pregnancy; they consequently become much narrower at the time; in the latter months, indeed, they



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they are almost entirely effaced, so that the tubes and ovaries, which they contained before the enlargement of the uterus, are now applied immediately to the lateral and inferior parts of the uterus, in consequence of the manner in which this organ has separated the two layers of peritoneum.

The anterior ligaments are two small folds formed by the peritoneum, as it is reflected from the back of the bladder to the front of the uterus. They are visible only when the two viscera are separated from each other, and they appear under the form of crescents, with the concavities directed upwards. The posterior ligaments are two other folds of the same membrane, where it is continued from the back of the uterus to the rectum. They resemble the former in every respect. The round ligaments are two whitish cords, extended from the upper angles of the uterus, in front and rather below the Fallopian tubes, to the groins. They pass first outwards and rather upwards, in the broad ligaments, on the front surface of which they form a remarkable prominence, they then pass on the inner surface of the iliac vessels, behind the peritoneum, to the upper opening of the abdominal ring. They traverse that canal in a direction obliquely downwards and inwards, just as the spermatic cord does in the male subject, and escape at the lower orifice. They then separate into several threads, which are lost in the cellular substance of the mons veneris and labia. These ligaments are slightly flattened in their whole extent, and broader at their two extremities, than in the middle. They are arched, so as to describe altogether a semicircle.

The round ligaments are composed of longitudinal fibres, consisting apparently only of a dense cellular tissue, very slightly susceptible of extension, of blood-vessels and lymphatics, and nerves. As they are swelled in pregnancy, and in some affections of the uterus, this circumstance has been employed to explain the pains in the groins experienced by females on such occasions. They contribute to fix the uterus in its position, and to limit its motions.

The ligaments, which we have just particularized, are so disposed, as to allow to the uterus, in its natural state, a certain degree of mobility. Hence its situation may be slightly changed in all the considerable motions of the abdominal viscera in general; coming to the ground on the feet with much force, a violent exertion in raising a considerable weight, a deep, forcible, and long continued inspiration, all tend to force the uterus downwards into the vagina, and thereby to produce the affection termed prolapsus or descent of the uterus. Distention of the bladder, or of the rectum, occasions changes in the position of the uterus. But age and pregnancy produce the most signal effects in the position of this organ.

In an adult and unimpregnated female, its length is about  $2\frac{1}{2}$  inches, its thickness one inch, its breadth at the fundus  $1\frac{1}{2}$  or 2 inches, and at the cervix about 10 lines. Although it returns after parturition to its original size, it never becomes again so small as it was in the virgin. Its figure on the whole is triangular, with the base upwards, and the apex downwards, and flattened from before backwards. It is divided into two parts, a superior and broader, named the body; an inferior and narrower, called the neck. The body of the uterus is nearly oval externally, with the greatest diameter transverse. We observe in it an anterior and a posterior surface, a superior, an inferior, and two lateral sides. The anterior surface, slightly convex, slopes gently downwards and forwards, and corresponds to the bladder. The posterior, more convex, is inclined in the same direction, and is contiguous to the rectum. The superior edge, which is named the fundus, and which extends from

one Fallopian tube to the other, is gently convex, and supports the convolutions of the small intestine. At the ends of this upper edge angles are formed between the fundus and the lateral sides of the viscus. To these angles of the uterus the round ligaments, the Fallopian tubes, and the ligaments of the ovaries are attached. The inferior edge, much shorter than the superior, is continuous with the neck of the organ; and indeed the line of separation is imaginary. The lateral sides are very short, slightly convex, and converging; they give attachment to the broad ligaments, and are concealed by them.

The neck of the uterus resembles a cylinder, slightly flattened from before backwards, and continued downwards from the body. Its long axis is perpendicular to the transverse diameter of the body. We describe in it an anterior and posterior surface, two lateral margins, and a superior and inferior extremity. The two surfaces are convex and smooth; the former corresponds to the bladder, and the latter to the rectum. To the sides, which are straight, the broad ligaments are attached. The superior extremity is continuous with the body of the organ; the inferior is obliquely embraced by the vagina, in which it projects, more considerably on the interior than on the posterior part. This extremity is perforated by an oval opening, with its long diameter placed transversely, named the os uteri, os internum, or os tincæ. The latter name has been given to it from a comparison to the mouth of the tench; the end of the uterus is obtuse, and as the aperture is transverse, there is some resemblance to two thick lips. In a newly born child, the length of the opening is two lines; in a girl of twenty years, three lines; in women, who have had children, five to eight lines. The orifice is always naturally gaping, but it is more or less so, in proportion as women have had many children, or none. Instead of being exactly in the middle it is rather behind; so that the anterior lip of the orifice is the thickest. That portion of the cervix uteri, which projects into the vagina, and forms the os tincæ, is about four or five lines long in front, and rather more behind: it measures about eight or nine lines transversely, and six or eight from before backwards, being slightly flattened in that direction. This part of the uterus is sometimes much longer and thicker, without any displacement of the organ, or swelling of its neck. In women who have had many children, the neck of the uterus is generally thicker, and more rounded. Its orifice is almost always very gaping, and the lips more or less irregular, presenting generally one or more grooves or chops, separated by a kind of tubercles. The os uteri may however be as regular in its figure in women who have had children, as in others: and, on the contrary, it may present in the latter those irregularities which are more usual in the former. Hence the inferences drawn from the state of this part, in instances where infanticide is suspected, or where parturition is supposed to have been concealed, are very liable to uncertainty.

The cavity of the uterus is proportionate to the bulk of the organ when it is empty; the parietes are contiguous, and leave between them no farther vacuity than suffice to hold a little mucous fluid. In this hollow the menstrual discharge flows, and the produce of conception is received. It is divided into two parts, one belonging to the body, the other to the neck of the organ. Of these, the former is the largest: its figure is nearly triangular, especially when the uterus has experienced no alteration in its bulk. We have to notice in it an anterior and a posterior surface, three edges and three angles. The two surfaces are smooth and contiguous to each other. On each of them a slightly prominent longitudinal line may be observed,  
dividing

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dividing them into equal right and left parts. Of the three margins one is superior, and two lateral: they are slightly concave, particularly in women, who have had many children. The superior, which makes the basis of the triangle, and is continued from one Fallopian tube to the other, is usually the shortest: sometimes, however, it is the longest. Of the three angles, two are superior, and one inferior. The former may be considered as two slender appendages of the cavity, terminating at the Fallopian tubes. The inferior angle presents an opening of about four lines in extent, communicating with the cavity of the cervix. The cavity of the body of the uterus is lined by a mucous membrane, on which the vessels that furnish the menstrual blood terminate.

The cavity of the cervix uteri is a kind of canal, flattened from before backwards, and more capacious at the middle than at the two extremities; so that it has the figure of two cones, joined by their bases. Such is the figure which it constantly exhibits in women who have never borne children; but, from the time of conception, that extremity of the canal, which opens into the vagina, is dilated; and after parturition has once taken place, it is always found much wider than before. It then represents a cone, with the basis towards the vagina, and the apex towards the uterus. The cavity of the cervix uteri has an anterior and posterior surface, and a superior and inferior orifice. A great number of hard, and as it were callous rugosities, differently disposed in different subjects, may be observed on each of the surfaces. In order to see their arrangement to advantage, the uterus of a newly-born child, or of one not very old, should be selected. They will then be observed in an arborescent form (*arbor Morgagni*) on each surface. A hard ridge extends along the middle of each surface, and ends above in a flattened point, which is often continued with the line dividing the corresponding surface of the body of the uterus. The inferior end is prolonged to the os tincæ. From this kind of trunk laminae are extended laterally on each side; the superior ones forming nearly half right angles, and the inferior more open angles. The number of these plates may amount to about 15. They are continued outwards, describing a curve, of which the convexity is always towards the uterus, and the concavity towards the vagina. Their margin is grooved, except towards the outer end, which is smooth. The breadth of the laminae diminishes insensibly, and they disappear on the sides of the cavity, where the anterior and posterior ones are confused with each other. The superior are broader than the inferior. These laminae are not simple, they produce other smaller ones. More or less deep grooves separate the plates from each other: in the bottom of these are observed small eminences, like the teeth of a comb, passing from one lamina to another.

The disposition of these wrinkles is regularly such as we have described in newly-born infants; but, when the cervix uteri is enlarged in pregnancy, the eminences are flattened, and the whole structure is confused; this is still more remarkably the case just after parturition; the laminae are then nearly destroyed, and the arborescent appearance almost entirely effaced.

The superior opening of the cavity communicates with that of the body, so that they form indeed but one. The inferior has been already described under the name of os tincæ.

In the cervix uteri we may notice the openings of numerous lacunæ or short ducts ending in cul-de-sacs, concealed among the rugosities already described. Most of these are small; some are larger and longer. There are six or

seven just above the os tincæ, the fundus of which is towards the inferior end of the uterus. These are large, and receive the terminations of several smaller ones. They are filled with a mucous fluid, which can be squeezed out, and they will often admit of a fine bristle for a certain length. They are best seen in a woman who has just been delivered, or who has died in the latter periods of utero-gestation; the prominences being flattened, the lacunæ are more exposed. These organs secrete the mucous fluid, with which the cervix uteri is moistened.

We see also sometimes in this cavity a considerable number of round or oblong, larger or smaller follicles, formed of a thin membrane, filled with a clear mucous fluid, and not possessing any excretory duct. They adhere to the trunk or branches of the arborescent structure already described, and their number is not constant. Sometimes they are half buried in the substance of the uterus, sometimes they are completely isolated, and hold only by a pedicle. Their nature and use are not known. Probably they are one source of the mucous secretions of the part although we cannot explain how the secreted fluid is evacuated.

The thickness of the sides of the uterus varies from four or six lines to fifteen; but it is not uniform in all parts of the organ. It is much the same on the surfaces and edges. The fundus is generally the thickest; and this is thicker in the middle than towards the angles. The neck is rather thinner than the body. The substance of the organ is of a greyish colour, and a firm consistence, especially towards the neck, which is more compact than the rest of the organ. It consists of an external membrane, of a proper tissue, of an internal membrane, of arteries, veins, lymphatics, and nerves.

The external membranous covering is contributed by the peritoneum, which is reflected from the posterior surface of the bladder over the uterus, of which it covers the anterior surface, the fundus, and the posterior surface, is continued to the upper half of the posterior surface of the vagina, and is reflected from that viscus to the rectum. It adheres every where to the proper tissue of the uterus by means of a very fine and close cellular texture, without any fat. It is very difficultly separable, particularly at the fundus.

The proper tissue forms nearly the whole thickness of the organ. It is a greyish, dense, and very compact substance, very resisting to the scalpel or scissars, cutting almost like cartilage, and containing numerous small vessels. This substance, which appears cellular, spongy, and to contain fluids, is manifestly fibrous: but the order and arrangement of the component fibres cannot absolutely be determined in the unimpregnated state, on account of their being so inextricably interwoven. They are paler and more condensed in the cervix than in other situations, where they are softer and more red. Although in the empty state of the organ these fibres have scarcely any of the characters of muscularity, their nature seems to be sufficiently pointed out by the contractile powers which they exhibit in parturition.

The external membrane of the uterus is continuous on one side with the mucous lining of the vagina; and gives origin, on the other, to two prolongations, which enter into the Fallopian tubes. It is extremely thin, and so closely united to the proper tissue of the organ, that it seems to form one substance with it. It is reddish in the body of the uterus, and whiter in the neck. It is perforated by an infinite number of pores, which are merely the extremities of exhaling vessels, and give issue to the menstrual discharge.

*Appendages of the Uterus.*—Under this name are included



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the round ligaments which have been already described, the ovaries, and the Fallopiæ tubes.

The *Fallopiæ* or *uterine tubes* are two (a right and left) conical, tortuous, and vermiform canals, arising from the superior and lateral parts of the uterus. They float loosely in the cavity of the pelvis, being enveloped in the upper and anterior edge of the broad ligament, and fixed by their inner extremities. Their length is four or five inches; and the direction of their course very uncertain: it may be stated in general that they go transversely outwards, and that they bend backwards at their outer ends, so as to turn towards the ovaries. But, as they are in great measure loose, and as the edge of the broad ligament restrains them but slightly, the intestines, when distended with air or aliment, may displace them in different directions. The calibre of the tube is so narrow towards the uterus, that the orifice by which it communicates with this viscus will only admit a hog's bristle. It enlarges gradually to the middle, where it is slightly contracted, and dilates again to terminate by an aperture which communicates with the cavity of the abdomen. The tube is considerably broader at its end than at the uterus, but rather narrower than in the portion immediately preceding. The internal membrane of the tube, together with the external, which is formed of peritoneum, is produced to some length beyond this orifice, and forms round it a fringed and radiated kind of ornament, called the *fringe* (*pavillon de la trompe*; *morceau frangé*). When this part is examined in water, it has a very beautiful appearance, and seems composed of small separate leaves, like some flowers. The breadth of this membranous fringe is not equal at all parts: its circumference has somewhat of an oval figure. All the portions into which it is divided are not of the same length: the longest extends to the ovary, and is firmly fixed to its outer extremity, so that the fringed end of the tube is constantly retained near to that body. The fringes are conceived to possess a muscular structure.

The Fallopiæ tube is composed: 1st. Of an external membrane, furnished by the peritoneum, which covers it as it does the intestines; 2. Of an internal, soft and pulpy membrane, the surface of which presents every where more or less prominent longitudinal lines, considered by some authors to be muscular fibres. Indeed the office of the tubes seems to require the existence of contractile fibres in their composition; 3. Of a spongy tissue, compared to that of the urethra and corpus cavernosum, but the real nature of which is not understood. Very numerous blood-vessels are distributed in this substance, which appears to swell and experience a kind of erection in the act of copulation: in consequence of this the fringes are applied to the surface of the ovary; 4. Of blood-vessels, derived from the spermatic arteries and veins, of lymphatics, and nerves furnished by the renal plexuses.

That the office of the tubes is immediately connected with the business of generation, and that they convey the germ from the ovarium to the uterus, cannot be doubted: but we do not understand how they execute this function. We may observe that they form a communication between the uterine cavity and that of the abdomen: and, as the former communicates externally through the medium of the vagina, the serous membrane of the abdomen has thus a continuity with the surface of the body:—a circumstance that is observed in no other instance.

The *ovaries*, called by the ancients the female testicles, are two oblong, flattened, and whitish bodies, placed at the posterior surface of the broad ligaments, in which they are included. They nearly equal the size of small pigeons' eggs in the adult; but their flattened form gives them a different figure. Their long diameter is placed transversely. They

present two surfaces, two edges, and two extremities. The surfaces and the upper edge are loose, and present nothing remarkable except slight tubercular risings. The inferior margin adheres to the posterior edge of the broad ligament. The external extremity is connected to the longest of the Fallopiæ fringes; and the ligament of the ovary is attached to the internal end. This ligament is a small fibrous cord, about  $1\frac{1}{2}$  inch long, contained in the posterior part of the broad ligament, and fixed to the angle of the uterus behind the Fallopiæ tube. Some old anatomists regarded it as a canal destined to convey into the uterus the semen, which they supposed to be secreted by the ovaries; but it is in reality a solid fasciculus, similar in its nature to the round ligament, and having no other office than that of fixing the ovarium in its place. Yet the latter organ possesses considerable mobility; its situation in the broad ligament, which is itself moveable, gives it a power of motion. The intestines and the urinary bladder may make it change its position; and we know that it has sometimes been contained in a rupture.

The ovaria are composed; 1st. Of an external membrane, derived from the peritoneum forming the broad ligament; 2. Of a proper membrane, of a white colour, and firm fibrous texture, hardly separable from the proper tissue of the organ; 3. Of a fleshy substance, which is dense on the outside, more soft on the inside, where it is greyish, and in some degree cellular and spongy. In this substance are lodged some small, roundish vesicles, amounting in number to between fifteen and twenty. Scarcely visible in infancy; these are very apparent in adult and fruitful women. Generally, in old women, these vesicles are no longer visible, and their place is occupied by hardish tubercles. The vesicles are not all of the same size: those which are near the surface of the organ are as large as hemp-seeds; while the others, being more deeply seated, are considerably smaller. These bodies are placed in the cellular or spongy substance of the ovary, in which they may be said to be enchased; but they form for the most part small prominences under the external membrane. Others are completely elevated on the surface of the organ, and others again are concealed in the interior. They are not suspended by stalks, nor do they form any particular cells different from the cellular matter comprising the parenchyma of the ovary. They were very particularly described by De Graaf, and have often been called, after him, *ova*, or *ovula Graafiana*. They are generally regarded as so many germs, or rudiments of new beings. They are composed of a simple and very thin membrane, smooth internally, and containing a clear, sometimes yellow or reddish liquor, coagulable by heat and alcohol, and forming white threads, like the albumen of an egg.

The arteries of these parts are derived from two sources; *viz.* the spermatic branches of the aorta, and the uterine branches of the internal iliac. The former are more tortuous than the corresponding vessels in the male; they pass between the two layers of peritoneum, which form the broad ligaments, and are chiefly distributed to the ovaries. But they send numerous ramifications to the Fallopiæ tubes; others to the sides of the uterus, and some along the round ligaments, which communicate with small branches of the epigastrics. The chief arteries of the uterus are the uterine branches of the internal iliac trunks; the right and left. This artery first runs downwards, then turns up at the neck of the uterus, and enters between the layers of the broad ligament. It gives large branches to the vagina, then runs along the side of the uterus, from the neck towards the fundus, producing numerous arteries, which ramify over the organ in every direction. These have a tortuous course, and communicate freely with each other, and with those of the opposite side.

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Some ascend to the upper edge of the broad ligament, are distributed in the Fallopian tube and round ligament, and communicate with the spermatic.

The veins, like the arteries, may be referred to two divisions; the spermatic and uterine. Numerous branches come from the uterus, ovary, and Fallopian tube, and form a large venous plexus in the upper part of the broad ligament; under the name of corpus pampiniforme, this ascends towards the loins, and terminates in forming a single vein, which has the same termination in the male subject. A great number of venous ramifications accompany the arteries all over the viscus, but are in general less tortuous. They communicate freely with the spermatics. They form a large plexus running along the side of the uterus, with the uterine artery, and end in one or more considerable venous trunks, which join the internal iliac.

The uterus possesses numerous lymphatic vessels, which are divided into three orders: one of these ascends with the round ligaments, and goes to the inguinal glands; another joins those of the vagina, and passes to the pelvic glands; and the third, together with those of the ovary and tube, ascends with the spermatic vessels, to terminate at the glands in front of the aorta and vena cava near the kidneys.

The nerves come from the great sympathetic (the hypogastric and spermatic plexuses), and from the sacral pairs.

*Vital Properties of the Uterus.*—Until the period of impregnation, this organ seems to possess only that modification of sensibility and contractility, which are necessary for the purposes of nutrition, and the menstrual evacuation. It seems doubtful whether or no it is endowed with animal sensibility in its healthy state. It has been imagined, and asserted, that the contact of the glans penis with the os tinctæ, in copulation, is one source of the physical sensation experienced by the female on that occasion: this we conceive to be problematical. Haller states, that a wound of this organ by a leaden bullet produced very violent symptoms; *viz.* repeated faintings, and speedy death. It must be doubtful how far this could be referred to the uterus merely, as much other injury must have been inflicted in such a case. Animal sensibility is certainly developed in the uterus by disease, whether it exist in the natural state or no. The same observations may be applied to the vital properties of the Fallopian tubes and the ovaries. However obscurely the vitality of these organs may be exhibited, when not immediately engaged in the exercise of their important functions, it is manifested in a much more striking point of view by the sympathies established between them and other parts of the body. We have already shewn, that the removal of the ovaries at an early age entirely changes the subsequent characters of the animal; affecting even the organization of the bony and muscular parts of the frame. From the time of puberty, when the organs now under consideration acquire a fitness for exercising their particular functions, we shall find that their condition and various changes affect in the most striking manner all the other vital phenomena of the female constitution. The previous symptoms, the commencement and periodical returns of menstruation; the first impulses of love; the change to a new temperament; pregnancy and its various epochs; parturition and its consequences; lastly, the cessation of the sexual life, and the symptoms of the critical age, are so many remarkable changes in the organization of the female, keeping up a constant alternation of suffering and disease, of lively impressions, nervous and spasmodic affections, the influence and general result of which must be carefully attended to in appreciating the nature of woman, and the part which she has to fill in society. When we con-

sider these facts, and reflect that the inclinations, the appetites and tastes, in a word, all those qualities which impress the distinctive character on any animal, flow from the conformation and predominating influence of certain organs, and are modified by their degree of perfection, and the energy of their functions, we shall have little hesitation in referring the peculiarities of the female frame and constitution to the action of the generative organs taken altogether; an opinion which is expressed in a more limited way by Van Helmont, “*propter uterum solum, mulier est id quod est.*”

*Development of the female Organs of Generation.*—These, like the corresponding parts in the male, are very early in their original formation; but they grow less rapidly in proportion towards the latter periods of gestation. This must be understood of other internal parts; for the vulva, which bestows the distinctive external sexual character, assumes a more decided figure towards the time of birth. From the various parts composing it we must except the clitoris; for although it possesses in a fœtus at the full time a considerable size compared to its magnitude, when the formation of the generative apparatus is complete, it is nevertheless much less developed at the time, in proportion, than at the third or fourth month: and we may observe, in general, that it is more prominent in proportion as the fœtus is younger.

Although the female organ present no phenomenon analogous to the descent of the testis in the male, the round ligament is sometimes accompanied by a small cul-de-sac of peritoneum, similar to that which forms the tunica vaginalis. The existence of this canal was first recognised by Nuck, who called it a diverticulum, described it as being about half an inch in length, and by no means constant: (*Adenographia curiosa, cap. 10. De peritonæi diverticulis novis.*) The fact was questioned by some; but the same circumstances have been observed by other accurate anatomists. Camper found the canal in three out of fourteen newly born children: and Le Cat observed, in a woman of 46, a canal of the size of a goose's quill, leading through the ring into a small canal that would admit the finger. (*Phil. Trans. v. 47.*) Wrisberg has particularly investigated these diverticula. In nineteen out of two hundred female subjects, he found an opening, generally on both sides, but sometimes on one only, leading through the ring into the groin or labium, lined by peritoneum, and placed over the round ligament. These canals, in different instances, would admit a probe, a quill, or the finger. (*De testiculorum descensu, &c. in the Göttingen Commentaries for 17, 8.*) We do not know that this canal is closed before birth, as the tunica vaginalis is in the male, nor that its existence in the adult at all favours the occurrence of hernia.

At the time of birth, there is a considerable proportion of fat under the integuments of the pubes; the labia are very well formed, and the clitoris is proportionally larger than it will be in the sequel. The latter circumstance, which is very singular and unaccountable, has sometimes occasioned mistakes in the sex of newly born children. The nymphæ are so broad as to exceed the level of the labia, and are remarkably thick and long: they do not in general end by a point, as in the adult, but by a rounded extremity. The fossa navicularis is large. The entrance of the vagina, although the hymen exist constantly at this time, is larger in relation to the diameter, which it presents at puberty, when the parts have experienced no unnatural violence. The opening does not appear to participate in that development which the rest of the vulva undergoes after birth. The vagina, considerably advanced in its formation in comparison with the uterus and its appendages, is particularly remarkable for its length. Its inner membrane, of which the rugosities are very well

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marked, is nearly white, and does not exhibit those successive shades which, at a more advanced age, distinguish its orifice, its middle, and its posterior extremity. In the newly born child, and during the first years of life, the uterus does not occupy the cavity of the pelvis; together with the ovaria and tubes, it is placed above the superior aperture. At this time it is very small, and has a very different figure from what it presents when perfectly developed. The neck is larger and thicker than the body, which narrow, and elongated, has not the triangular figure. The parietes of both are thin, and the cavity very small. The tubes are proportionate in length to their future state.

From birth till puberty, the generative organs of women experience still fewer changes than those of men: yet they grow in proportion as the body encreases; and those, which at first were remarkable for their size, as the clitoris and nymphæ, gradually lose this distinction. The uterus appears less elevated above the pubes, in proportion as the pelvis changes its form and proportions, and as the superior aperture becomes less inclined. It encreases principally in breadth and thickness, but its growth is not very rapid. The changes which occur at the time of puberty, considered in an anatomical point of view, are not considerable: there is a remarkable revolution in the vital powers of the generative system, rather than any considerable increase of the organs. The internal parts, however, at this time, have acquired their complete size, and the external organs become covered, in the situations already particularized, with hairs.

In extreme old age, the generative organs of the female, already reduced for a considerable time to complete inaction, bear the marks of decrepitude common to the whole frame. The vulva presents the most remarkable changes; this is the part most affected by the performance of the sexual functions, and many parts of it partake the general emaciation. The prominence of the mons veneris is nearly effaced, and a great part of the hair, which covered it, is lost; the remainder becoming grey and straight. The labia and nymphæ are soft and flaccid; the latter sometimes can scarcely be said to exist: the mucous membrane is whitish, or at least very pale in its colour. The state of the vagina presents nothing very remarkable. The volume of the uterus is diminished, its parietes having become thinner. The tubes and round ligaments are also in some degree reduced. The ovaria do not exceed half the size which they had in the adult age; they are sometimes very dense, and marked with deep grooves, so as to render the surface tubercular; in other instances, their substance is removed, so that they are reduced to a very thin appearance. The vesicles contained in their parenchyma are no longer discernible.

*State of the Generative Organs during Pregnancy.*—The uterus, intended to serve as a receptacle for the fœtus, dilates after it has received the germ from the ovary, and enlarges in proportion as this is developed; its blood-vessels bring an additional quantity of fluid, from which the fœtus draws its support: lastly, at a certain period, fixed by the laws of nature, it discharges the produce of conception by virtue of the vital properties, with which it has been endowed, during the remarkable change of its organization. Such are the threefold objects, to the attainment of which are directed the new dispositions acquired by this organ during gestation.

The anatomy of the gravid uterus has been most fully elucidated by Dr. William Hunter, whose splendid and beautiful plates form an epocha in the history of our knowledge of this subject. "The anatomical Description of the human Gravid Uterus and its Contents," London, 4to. 1794, drawn up by Dr. Baillie, from the papers of Dr. Hunter, contains

a very clear account of the subject; this, with the plates already mentioned, is the source from which the following description is principally derived. The observations, unless where it is otherwise expressed, apply to the state of the organ as it is found in the 9th month.

Considerable variety exists in the size of the organ. The child and placenta may be twice as large in one case as in another: there may be six or eight times more water in one case than in another: not to mention the differences arising from there being only one child or twins, &c.

The development of the uterus appears to be immediately produced by the general distention of the liquid surrounding the fœtus, and not by the fœtus itself, since the latter does not come in contact with the organ. The size of the part depends principally upon the quantity of the liquor amnii. For, though women who have twins, or a very large child, are commonly observed to be very big, yet the greatest number of those who are really very much swelled out, are so only from a vast quantity of water. In such cases there is frequently but one child, and that very often a small one.

The general figure of the uterus is oviform; the fundus answering to the largest extremity of the egg, and the cervix and os-uteri to the small end: but the fundus is larger and more flat, or less pointed, in proportion to the lower extremity of the uterus, than one end of an egg is to the other; and the whole uterus seems more or less compressed, so as to be broader from right to left, than it is from the forepart backwards. Besides these more constant deviations, the figure of the uterus differs from the regular oviform, from a variety of accidental causes, as it adapts itself to the neighbouring parts, to the attitude of the body, and to the position of the contained child. In order to conceive these varieties more easily, we must remember that in most cases the uterus is not so completely filled as to be upon the full stretch. Were it out of the body, and filled artificially, it would easily contain more than it actually does. Thus the uterus, like a bladder of water not quite full, is plastic, and moulds itself into various shapes from accidental circumstances. The figure of the organ, in particular situations, is modified by the pressure of the surrounding parts: the brim of the bony pelvis has the effect of a belt girding the lower part of the organ, and the projections of the spine, and of the psoæ muscles and iliac vessels, mould the outside of the uterus into corresponding cavities. The attitude of the body influences the figure of the uterus, as the parts against which it rests vary in different postures. The position of the child is another cause influencing the figure of the uterus. Not only in dead bodies do we see the parts of the child making various different projections on the outside of the uterus; but we can frequently observe the same variety in the living state, by examining the outside of the abdomen. The round projecting ball, made by the child's head or buttocks, is commonly very perceptible, and in many instances smaller parts, as the knees or elbows, can be distinctly felt. Dr. Mackenzie met with a case of twins, where the uterus, instead of making one compacted oval body, had stretched into two distinct bags, for containing the respective fœtuses; so that its outside was marked by a notch, dividing it into two apartments, as deep and distinct in proportion, as that in the heart represented on cards. The organ often stretches unequally in the corresponding opposite parts; so that either the right or the left half may be considerably larger than the other. It may swell unequally on the front or back part, so that the distance between the insertions of the Fallopian tubes may be much smaller either before or behind than in the opposite directions. In the unimpregnated state, it has commonly one triangular cavity: but it is sometimes subdivided, at its upper

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part, into two lateral cavities, so as to bear some analogy to the two horns of the uterus in a quadruped. This peculiar conformation may explain the unequal extension of the two sides in some cases of pregnancy; and may elucidate the above-mentioned case of Dr. Mackenzie.

The small or lower end of the organ is placed in the cavity of the pelvis. This generally contains the greater part of the child's head, and fills up the cavity so completely, as to press the bladder against the pubes, and the rectum against the sacrum. The os uteri is directed against the coccyx, or the lower part of the sacrum. The body and fundus, which contain the rest of the child and the placenta, are so placed in the front of the abdomen, from the brim of the pelvis upwards to the epigastric region, as to be under and before all the other bowels, and in immediate contact with the parietes abdominis, and to occupy the whole space from one hip-bone to the other, and a proportional extent from these bones upwards. As it rises up from the cavity of the pelvis into the hypogastric and umbilical regions of the abdomen, the loose connections of the intestines and omentum easily account for these parts being pushed up before it.

The axis of the uterus is oblique, its lower end being turned backwards, and the upper proportionally forwards. This obliquity is changed by the attitude of the body, and by many other causes. In the erect posture, the weight of the uterus presses the forepart of the organ into a greater rotundity, and its axis then approaches the nearest to a transverse or horizontal line. In the recumbent posture, the contrary situation is exhibited. In a first pregnancy, the uterus stretches itself higher up in the epigastric region, and its axis comes nearer to the longitudinal or vertical direction, because the parietes of the abdomen do not easily give way; but in a woman who has had many children, the abdomen, by repeated distention, is rendered more loose and pendulous, and the uterus extends forwards rather than upwards. This position is more remarkable in very short subjects; because in them the chiel is so near the pelvis, that the uterus is stopped in ascent. The same circumstance happens, and for a similar reason, when the pelvis is very narrow: as no part of the organ, in such a case, can be lodged in the pelvis, it must be placed proportionally higher. In a very short and crooked woman, on whom the cesarean section was performed, the fundus uteri was not only turned forwards, but even a little downwards. As she lay upon the table, the navel could not be seen, as it was placed on the posterior and inferior part of the abdominal tumour. In order to expose that part of the abdomen to the surgeon, it was necessary to lift up the fundus uteri, without which the hypogastric region would have been inaccessible. The deviation of the organ towards the right or left side cannot, in general, be very considerable; as it possesses nearly the whole space between the hip-bone, and its lower extremity is fixed to the pelvis. A small lateral obliquity is very common; and we can easily suppose, that in a reclined posture, the projection of the lumbar vertebrae will throw rather more than one-half of the uterus into the lateral cavity between the spine and one hip-bone. We know, indeed, that in all the last months, the abdomen is often more full on one side than on the other. Women say in such a case, that the child lies on one side, and they judge rightly. Where the child lies the bulk must be both more considerable and more permanent, but where there is only uterus, placenta, and water, the swelling will be softer, and project less. The pressure of the child, when it lies more in one side than in the other, makes the limb of that side weaker, more

benumbed, and more liable to cramps, and œdematous swellings.

*Of the Ligaments, Tubes, and Ovaria of the Pregnant Uterus.*—It has been commonly observed that the ligaments and tubes of the pregnant uterus are attached lower upon the side of the organ than they were in the unimpregnated state; and the reason is very obvious. The peritoneal coat of the uterus makes the broad ligament on each side, much in the same manner as the analogous membrane of the intestinal tube makes the mesentery. When the woman is not pregnant, the ligament is of considerable breadth, the spermatic vessels pass between its two laminae, the round ligament runs downwards and outwards, on its anterior surface, and the tube runs in loose serpentine turns on its upper edge. But in proportion as the circumference of the uterus grows larger, the broad ligaments become narrower, their posterior lamella covering the posterior surface, and their anterior lamella the anterior surface of the uterus itself. We observe now, that the round ligaments do not run down on the forepart of the broad ligaments, but upon the forepart of the body of the uterus itself. In proportion as the fundus rises upwards, and increases in size, the upper part of the broad ligament is stretched, that it clings close to the side of the uterus, so that in reality the broad ligament disappears, no more of it remaining than its very root; namely, its upper and outer corner, where the group of spermatic vessels passes over the iliacs, to the side of the uterus. In this state, although the small end of the tube opens into the same part of the uterus, as before impregnation, yet the tube has a very different direction; instead of running horizontally outwards, it passes downwards, closely attached to the side of the uterus. Behind the fimbriae lies the ovarium, also connected to the uterus. The fimbriae and ovarium are commonly placed upon the iliac vessels, or fleshy brim of the pelvis, behind the group of spermatic vessels.

The round ligaments run almost perpendicularly downwards from the fundus uteri to their passage through the muscles; they are considerably enlarged in thickness, and are so vascular, that when injected they seem to be little more than a bundle of arteries and veins. Their arteries are all convoluted. Both their arteries and veins proceed principally from the spermatics, and anastomose evidently with the external vessels in the groin or upper part of the labia. Even in this enlarged state of the round ligaments, it is very difficult to say how they terminate in the groin; they appear to be insensibly lost. The tubes are more fleshy, vascular, and soft in their substance, and are less convoluted than in the unimpregnated state. The fimbriae and internal rugae are larger and much more beautiful, especially when their vessels are well injected. The ovaria, excepting that which contains the corpus luteum, seem to have undergone no remarkable change. The latter body can be distinguished by a rounded fullness, and frequently a considerable prominence, sensible both to the sight and touch, upon the middle of which there is a small pointed cavity or indentation, like a cicatrix. Upon sitting the ovarium at this part, the corpus luteum appears a round body, of a very distinct nature from the rest of the ovarium. Sometimes it is oblong or oval, but more generally round. Its centre is white, with some degree of transparency; the rest of its substance has a yellowish cast, is very vascular, tender and friable, like glandular flesh. The larger vessels appear round its circumference, and send smaller branches inwards. A few of the larger vessels are situated at the cicatrix or indentation on the outer surface of the ovarium; and are there so little covered, as to give that part the appearance of being bloody,

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when seen at a little distance. When there is only one child, there is only one corpus luteum; and two in case of twins. There may be, in the latter case, two distinct ones in one ovarium, or one in each ovarium. The sex of the fœtus has no relation to the corpus luteum being formed in the right or left ovary.

*Thickness of the Uterus.*—Those who say that the uterus grows thicker in proportion as its bulk is increased, have probably been deceived by examining the uterus of a woman who died some hours or days after delivery. In that contracted state the uterus is often found even two inches thick: but in the natural distended state, though there may be some difference, the thickness, in general, is but little more considerable than before impregnation. When not injected, its ordinary thickness is from one to two-thirds of an inch; when its vessels, and particularly the veins, are pretty well filled with wax, its thickness is thereby considerably increased, more especially where the placenta is fixed, on account of the number and size of the vessels at that part. For this reason only, perhaps, the uterus is thickest at that part, and for the same reason it is thicker towards the fundus than near the cervix. Much variety may be observed with respect to thickness: and such inequalities in the same individual, that even where the placenta did not adhere, the uterus may be almost twice as thick at one part as at another. On opening the organ, its thickness is generally found more considerable than external examination would have led us to expect. For its substance is soft, and a fluctuation, like that of water in a thin bladder, may be felt.

*Blood-vessels.*—There is no circumstance, in which the gravid uterus differs more from the unimpregnated, than in the size and termination of its vessels. The arteries, both spermatic and hypogastric, are very much enlarged. There are infinite numbers of anastomosing arteries through the whole substance of the part, so that the whole system makes a general net-work, and the branches are convoluted or serpentine in their course. None of the larger ramifications are seen for any length of way upon the outside of the uterus. As they branch from the sides, they disappear by plunging deeper and deeper into the substance. The arterial branches, which are much enlarged, are those which run towards the placenta; so that, wherever it adheres, that part appears evidently to receive by far the greatest quantity of blood; and the greatest number, both of the large and small arteries at that part, pass through to the placenta, and are necessarily torn through upon its separation. The veins of the uterus appear to be still more enlarged, in proportion, than the arteries. From the sides of the uterus they ramify through its substance, running deeper and deeper as they go on, and without following precisely the course of the arterial branches. They form a plexus of the largest and most frequent communications which we know of among the vessels of the human body. And this they have in common with the arteries, that their larger branches go to, or rather come from that part of the uterus to which the placenta adheres; so that, when the venous system of the uterus is well injected, that part is evidently the chief source of the returning blood. Here, too, both the large and small veins are continued from the placenta to the uterus, and are always necessarily broken upon the separation of these two parts. The veins are without valves, and are therefore easily injected. In injecting them, we observe that at first they become turgid, and project on the outer surface of the uterus; but in proportion as we throw a greater quantity of wax into these vessels, they grow more flat and obscure; because the uterus itself becomes more filled and tense, which has the effect of com-

pressing the veins that run in its substance. On account of the large size of these vessels, and the appearance of cavities, which they exhibit on a section, the name of *sinuses* has sometimes been given to them.

The *lymphatics* are more numerous, and many of them larger than could have been imagined. They pervade the substance of the organ universally. Its peritoneal coat appears, like that of a calf's spleen, to be interwoven with a crowded plexus of these vessels; and where they get to the sides of the uterus, when filled with mercury, some of them are even larger than a goose's quill. Some are remarkably varicous, or enlarged at particular places.

We do not know that any change takes place in the nerves of the uterus during pregnancy.

*Muscular Fibres of the Uterus.*—The substance of the organ is rendered remarkably soft and loose in its texture by pregnancy; so that, when an incision is made into it, the wound can be easily made to open wide; or if a narrow strip be cut out, it can readily be extended to at least twice its original breadth. This laxity appears to depend on two causes; viz. the great quantity of large vessels in its composition; and the loose connection between the fasciculi of its fibres. When we speak of the muscular fibres, it is difficult to treat the subject with precision. We neither know their external appearance, nor their internal composition. They only manifest themselves to our senses, where numbers of them are collected into bundles, and make what we commonly call muscular fasciculi. In the quadruped, as, for instance, the cat or rabbit, the muscular action of the uterus is seen as evidently as that of the intestines, when the animal is opened immediately after death. In many parts, particularly of the internal surface of the uterus, these fibres have the same striking fasciculated appearances as we observe in common muscles; yet they are of a paler colour and harder texture. Dr. Hunter examined the fibres very carefully in a woman who died seven days after delivery. He stretched it gradually in warm water, and then inverted it, to have a full view of the inner surface. The remains of the decidua had passed off with the lochia, so that the fasciculated stratum of muscular fibres appeared to be bare, and to make the internal surface of the uterus. In many places, but particularly where the placenta had been fixed, the fasciculi left oval spaces between them, for the passage of arteries and veins, somewhat like those separations in the tendinous fibres of the abdomen and loins, where vessels pass out to the cellular membrane and integument. The cervix uteri, where the rugæ are situated, had not such regular nor so large fasciculi as the rest of the uterus. In the body of the organ the fibres were very regularly circular. The fundus was made up of two planes of concentric fibres, at the very centre of which was the orifice of the Fallopian tube. When this internal stratum was removed, the fasciculated appearance and regular direction of the fibres was less and less apparent, in proportion as the dissection was continued outwards; which seemed to be owing in great measure to the infinite number of branches and communications of the large veins. Afterwards, says the doctor, I had the most favourable occasion that could be desired, for examining the fibres on the inside of the uterus. It was in a woman who died at the end of the ninth month, without being in labour, and without having any flooding or discharge of waters. When I had examined, and taken out all the contents, I attended particularly to the internal surface of the uterus. I found it every where covered with a thin stratum of the decidua, through which the muscular fibres appeared, but with some degree of obscurity. Upon rubbing off this tender membrane with a cloth, it gave me

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pleasure to see how exactly the above description agreed with the appearances.

The existence of muscular fibres in this organ has not, however, been universally acknowledged. "Respecting the alleged muscular texture of the uterus," says Blumenbach, "I must observe that all the human uteri, which I have carefully examined both in the pregnant and unimpregnated condition (and I have had opportunities of such investigations, not merely in preparations, but in the most recent state after death) have not exhibited any thing that could be taken for genuine muscular fibres. The advocates for the muscularity of this organ must allow that the fibres differ most remarkably from all others in the body. I am more and more convinced every day that the uterus possesses no true irritability; but that it possesses, if any part of the body can be said to possess, a peculiar modification of vitality (*vita propria*) corresponding to its peculiar motions and functions, and not referrible to the common laws of irritability. These functions appeared so singular and peculiar to the old physicians and philosophers, that they called the uterus an animal contained in an animal." *Institut. Physiolog.* p. 422.

The mouth of the uterus differs considerably in the different times of utero-gestation. For the greatest part of the nine months, that is, till the cervix uteri be fully distended, there is a projection of both the anterior and posterior lip of the os tincæ; and in some women this continues till the very time of labour. But in most women, when they are at their full time, or very near it, the os uteri is flat, and makes only a small rugous hole, often not readily discoverable by the touch on the lower or posterior part of the rounded lower end of the uterus. The border of this orifice, and the internal surface of the uterus, for an inch or more all around, is full of little irregular cavities. These contain a tough gluten, which shoots across, and plugs up the inner part of the orifice. This gluten is commonly squeezed out from all the lacunæ, by the dilatation of the os uteri in the beginning and progress of the labour; and so losing its hold, it falls out. In the dead body, when the part is kept some days in water, the gluten swells out more and more from all these cavities, and then separates entirely. Then the innumerable lacunæ, which contained it being empty, are very visible. And if the gluten be thus carefully taken away, and be floated in water, its external surface is seen beautifully ornamented with all the processes which were drawn out of the innumerable lacunæ.

Dr. Hunter gives us the following account of the uterus in the earlier months of pregnancy. "In the third and fourth months, the substance of the uterus is become more soft than before conception, and all its vessels being proportionably enlarged, it appears to be much more vascular. We may, therefore, reasonably believe, even if we knew nothing from dissections of quadrupeds, that the uterus changes its nature in that respect from the time of conception, and receives a greater quantity of blood. Its thickness is only a little increased in its natural state, but considerably when the veins and arteries are artificially distended with any fluid. At this time the conception is lodged entirely in the fundus uteri, or in that part which in the unimpregnated state has a smooth internal surface; no portion of the conception stretching then down into the cervix uteri, or that part of the uterus, which is narrow and rugous within.

"The cervix uteri remains contracted and hard in its substance, and contains a tough and firm jelly, which cements and fills up its cavity so completely, that upon attempting to push a probe through it, the probe will as readily force its way through the hard substance of the uterus itself, as through the cementing jelly. When the uterus is

kept a considerable time in water, six or eight days perhaps, this cementing jelly swells, grows in proportion softer, and at last comes away, or falls off in one mass. Then the internal surface of the cervix exhibits a most beautiful appearance; being variegated with projecting rugæ, and innumerable intermediate narrow, but deep cavities, which lodged so many processes of the jelly. In separating the jelly, when by previous maceration it had been fit for such an operation, I have seen those processes drawn out of the little cavities as distinctly as we can see a hand drawn out of a glove: and when the jelly is carefully separated and floated in clear water, it preserves its figure, and exhibits a most elegant appearance, produced by the processes that shoot out from its surface all around.

"The os uteri, or very extremity of the uterus, is in some women narrow or pointed, with a very small orifice, that will just admit the point of a very small finger; and in some it is large, soft, or spongy to the touch, granulated upon its surface, and the orifice so wide as to admit the end of the finger full half an inch up with great ease. There the passage becomes narrow, and is closed with the gelatinous cement. The os uteri, all around its passage, is crowded with small cavities, containing the same sort of jelly, which by maceration swells, pushes out from the cavities, and comes away, leaving the cells void. This, no doubt, is part of the jelly which naturally comes away in labour. Some women have much more of it than others; and, in comparing different dissections, I have observed more of the jelly within the cervix uteri, and more likewise in the cells round the os uteri, in one subject than another.

"The uterus, at the time of three or four months, is by no means so tightly filled but that it would easily contain more. It is like a bladder therefore, so filled with water, that it would easily contain a third part more. Hence it is soft and swagging, and easily changing its shape, accommodates itself to the neighbouring parts.

"The situation of the uterus, which at first is in the cavity of the pelvis, but afterwards gradually rises up into the cavity of the abdomen, and the changes which its ligaments undergo, may be easily conceived by any person acquainted with the state of those parts before conception, and who has considered what has been already said about the same things in the ninth month of pregnancy.

"The peculiarities of the ovarium are very different at the different periods of utero-gestation. In the earlier months the corpus luteum is considerably larger and more vascular; and within it there is a considerable and evident cavity containing a fluid. When the uterine vessels have been injected, I have observed that the wax very easily extravasates into that cavity. On the outside of the ovarium there is a little pit, which looks like a hole, leading into the cavity of the ovarium. But in the cases which I have seen, no bristles would pass; it appeared to be an obliterated duct, or passage grown together."

The serous covering of the uterus, derived from the peritoneum, undergoes very considerable extension during the enlargement of the uterus in pregnancy. We have already shewn that the broad ligaments nearly disappear at this time, but there is no accession of the same kind either before or behind, as the bladder and rectum still continue to be covered to the usual extent by that membrane. The increased surface of the peritoneal coat must be ascribed therefore to an extension of the membrane.

As the mucous surface of the organ is the medium of communication between the uterus and the secundines, its changes refer to the purposes accomplished by this connection. In the natural state, it exhibits merely the fine orifices of ex-  
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haling vessels, but after conception a large number of considerable arteries and veins pass from it to the surface of the ovum; and these are more numerous and large in the situation of the placenta than elsewhere. These communicating vessels have been described already in the article EMBRYO. Towards the latter periods of gestation the vulva becomes swollen and relaxed, assuming a state which favours its dilatation in the act of parturition.

The vital properties of the uterus, as well as its organization, are considerably altered after conception. The organ acquires animal sensibility; hence women feel the motions of the child, and even experience very considerable pain in particular positions of the fœtus; hence too the sharp pains felt in parturition. We do not know whether much pain is experienced by the incision of the uterus in the cesarean section. But, supposing that it is not, the fact would not prove that the organ is not possessed of animal sensibility. Its powers may render it susceptible of some stimuli and not of others. When no circumstances interrupt the ordinary phenomena of pregnancy, we have no proof, until the natural period of this condition arrives, that the organ possesses so strong a contractile power as that which we see exerted in parturition. We might even believe that this property is not developed until the end of pregnancy; but there is no epocha of gestation, from the first presence of the germ in the uterus, at which this contraction may not be excited by the action of particular causes, which, under certain circumstances, are powerful enough to produce the expulsion of the child. Violent contusions of the abdomen, and penetrating wounds affecting the uterus, are frequently followed by abortion. Violent passion may cause this premature expulsion of the fœtus. The same effect is produced by the evacuation of the waters of the amnios, independently of any other cause; the uterus, when no longer distended, contracts, and abortion ensues. This contractile power, with which the uterus becomes endowed on the change of its organization, partakes of the characters of animal contractility and of irritability. The inactivity of the uterine parietes, until the termination of utero-gestation, resembles, in some respects, the quiescent state of the voluntary muscles, when they are not excited by the influence of the brain; and the contraction, by means of which this organ expels its contents, can be compared only to the exertion of those muscles. On the other hand, the contractility of the uterus is independent of the cerebral influence, and its exercise is absolutely involuntary; this circumstance particularly characterizes irritability in those organs which possess it in the most remarkable degree, as the heart. Like the latter power, it may be sympathetically roused, when the action of the uterus is suspended during or after parturition; and it continues for some time after apparent general death.

The attention of physiologists has been much occupied in investigating the immediate cause of parturition; that is, the cause which calls into action the contractile power of the uterus at the end of utero-gestation. Many adopt the following explanation. They admit a species of opposition between the body and neck of the uterus, during gestation, the resistance of the latter overcoming the tendency of the former to contract. As the neck is gradually obliterated, its opposition is diminished, and it then gives way to the contractions of the body and fundus. Against this explanation we may urge that the supposed struggle between two opposing forces is purely hypothetical, that there is no evidence of any contraction or attempt at it during pregnancy, and that it comes on quite suddenly at the expiration of the term. It is this sudden exercise of the contractile power, at the end of the ninth month in the human species, that marks

the term of gestation, and for which we can assign no other cause than the immutable laws by which the operations of nature are regulated. However this question may be decided, it is clear that the contraction of the uterus alone does not accomplish the expulsion of the fœtus. The diaphragm and abdominal muscles assist in the operation; and hence parturition is in some degree voluntary, is accelerated in some cases by the courage of the individual, while in others it cannot be concluded without the assistance of art, in consequence of the strength being exhausted. Yet this action of the abdominal muscles is not so indispensable, but that the uterus can get rid of its contents without such aid. We know the extraordinary facility with which parturition takes place in some women, who, in consequence of particular circumstances in their condition, exert themselves even to retard the process; and the expulsion of the child is sometimes completed at the approach of death, when the abdominal muscles can hardly be supposed to contribute.

After the expulsion of the child, and of the secundines, the action of the uterus still continues, and the organ is gradually reduced in its bulk. For a short time its parietes are in a state of increased thickness; the vessels, being compressed by this permanent state of contraction, pour out but a very small quantity of blood, notwithstanding the preceding dilatation of their orifices. This blood, effused very slowly, is soon succeeded by an abundant secretion of mucus from the surface of the uterus, constituting a species of discharge peculiar to women recently delivered, and known by the name of lochia. This evacuation lasts for a longer or shorter time, and probably does not cease altogether, until the uterus has regained its original state. The contraction of the organ is owing at first to the evacuation and contraction of its vessels; but soon nutrition is carried on in it with less activity, while absorption proceeds vigorously until the excess of matter deposited for its development has been removed.

### *Physiology of the Female Organs of Generation.*

*Puberty and Menstruation.*—From the uterus of every healthy woman (at least with very rare exceptions) who is not pregnant, or who does not give suck, there is a discharge of blood at certain periods, from the time of puberty to the approach of old age (during a period in general of about 30 years); which, from the periods or returns of the discharge, is called the menses or catamenia, and, from the general regularity of its appearance, is termed in French les regles. The commencement of menstruation is coeval with that signal revolution in the female constitution, which indicates the power of executing the generative functions, and may be regarded as the development of the sexual life. It is therefore one of those circumstances which, taken altogether, mark the period of puberty in females. At the same time their complexion is improved, their countenance is more expressive and animated, their attitudes graceful, and their conversation more intelligent and agreeable; the tone of their voice becomes more harmonious, their whole frame, but particularly the breasts, are expanded and enlarged, and their minds are no longer engaged in childish pursuits and amusements. These phenomena have been described very elegantly by Harvey: “*næ minus notum est, quanta virginum alicratio contingat, incremente primum et terefecto utero; pubescent nempe, coloratio evadit, mammae prominent, pulchrior vultus renidet, splendent oculi, vox canora, inectus, gestus, sermo, omnia decora fiunt.*”

The whole human race is subject to this law, and the accounts of some travellers, Rating that the Brazilian or Samoied women are exempt, have not been confirmed by more



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recent and accurate inquiries. It is a general and essential phenomenon in the life of woman, and in different climates, or the varieties of the savage and civilized states, are capable of modifying the phenomenon, their influence is not sufficient to annihilate it altogether, even in the frozen and inhospitable regions, where some writers have supposed that it does not occur in a constant and regular manner. It is hardly necessary to refute an opinion, which has prevailed very generally, that whole nations, particularly Americans, are not liable to this discharge. In their visits to those countries, Europeans saw numerous females in a state of nakedness, without observing any signs of the discharge, which may be accounted for by two circumstances. The women at that time are generally supposed to be in an impure state, and to communicate a malignant influence; they are consequently compelled to shun society while the discharge lasts, and to avoid the sight of man by hiding themselves in solitary huts. Travellers have also observed that their scrupulous attention to personal cleanliness, and to the modest attitude of the lower extremities, would prevent the spectator from discovering any traces of the catamenia. The discharge is peculiar to the female of the human species, which, in the language of Pliny, is the only "animal menstruale." Many naturalists, says Blumenbach, and among others Buffon, have ascribed a periodical flux of this kind to some other animals, particularly of the monkey kind. But having had the opportunity of observing several individuals for many successive years, I discovered that these supposed catamenia did not exist at all in some, while in others there was a small occasional uterine hemorrhage appearing at no regular intervals. (Institut. Physiolog. sect. 37.) There is a great determination of blood to the organs in animals when they are in heat; this is attended with a mucous secretion, and sometimes even blood has been discharged, so as to give rise to the erroneous notion of their being subject to the menstrual flux. Such a casual and infrequent occurrence can by no means be compared to the regular periodical discharge observed in women almost without an exception. On the other hand there are examples of women who have never menstruated, and of others, in whom this discharge has not appeared through long periods of their lives, without any ill consequence. Dr. Denman knew two instances in which the menses had never been discharged; the individuals married, but had no children. (Introduct. to the Pract. of Midwifery, 4to. p. 115.) Some continue to menstruate during the time of suckling, and the circumstance is not very rare, although it is the general rule that the discharge should cease at this time. The vital powers are differently employed, and their exercise has a different object and direction. Pregnancy almost invariably interrupts the process. The important functions carried on in the uterus at this time require all the powers of the mother; and the adhesion of the ovum to the uterus seems to form an insuperable mechanical obstacle to the discharge. Hence Mr. Denman states that he has never known an instance of menstruation during pregnancy. The cessation of the discharge without the presence of any unhealthy cause, is the only sign by which women know that they have conceived. Authors relate many examples, however, where the catamenia have flowed during gestation; but very strong evidence would be necessary to prove a circumstance so unlikely in itself.

The menses may appear prematurely in some women, from peculiarity of organization, as the phenomena of puberty have occurred at unnaturally early periods in men; and the circumstance must be referred to original difference of constitution. Haller knew a girl of good family, nine years of age, well constituted both in mind and body, who had

been subject to the regular periodical return of the catamenia for some years, without any other apparent disadvantage than that of being rather short and delicate in her make. He mentions another instance in Switzerland of a girl having a child by her uncle at nine years. Many of the accounts of menstruation in early infancy must be deemed morbid or symptomatic discharges, and cannot be referred to the catamenia. When the female constitution from any cause is disposed to, or requires a sanguineous discharge, it is commonly made from the vessels of the uterus.

The early or late appearance of the menses may depend upon the climate, the constitution, the delicacy or hardness of living, and upon the manners of those with whom young women converse. In general, the warmer the climate the sooner the menses appear. In Greece, and other warm countries, girls begin to menstruate at eight, nine, and ten years of age. According to Thevenot and Chardin they even marry and bear children at eight and nine years of age in some parts of Asia. The discharge does not appear in Europe until the female has nearly attained her full growth. Haller mentions the twelfth and thirteenth years as the usual periods in Switzerland; the discharge appears sooner in the more southern countries of Europe, and later as we approach to the north. According to Linnæus, in his "Flora Lapponica," the women of Lapland do not menstruate until a maturer age, and then in small quantities, at long intervals, and sometimes only in the summer. But if the process does not go on according to the general prevailing rule in the country, they suffer equal inconveniences as in warmer climates, where the quantity discharged is much greater, and the periods shorter. In this country girls begin to menstruate from the fourteenth to the eighteenth year of their age, and sometimes at a later period, without any signs of disease; but if they are luxuriously educated, sleeping upon down beds, and sitting in hot rooms, menstruation usually commences at a more early period.

The variety in the time at which women arrive at puberty has given rise to some moral deductions. It has been assigned as the reason why women in hot climates are almost universally treated as slaves, and why their influence is so powerful and extensive in cold countries, where personal beauty is in less estimation. In hot climates, women are at the height of their beauty when they are still children in understanding; and, when their understanding is matured, they are no longer the objects of love. In temperate climates their persons and their minds acquire perfection at the same time, and the united power of their beauty and faculties is irrefragable.

At the approach of old age women cease to menstruate, but the time of the cessation is commonly regulated by the original early or late appearance of the menses. About the fortieth year, a little sooner or later, the regular periods of the catamenia are interrupted; and before the fiftieth year, profuse discharges occur followed by long intervals; about the time just mentioned, the catamenia generally cease, and the power of reproduction is lost. With those who began to menstruate at ten or twelve years of age, the discharge will sometimes cease before they arrive at forty; but if the first appearance was protracted to sixteen or eighteen years of age, independently of disease, such women may continue to menstruate until they have passed the fiftieth, or even approached the sixtieth year of their age. In this country, the most frequent time of the cessation is from the forty-fourth to the forty-eighth year, after which women never bear children. By this constitutional regulation of the menses the propagation of the species is, in every country, confined to the most vigorous

vigorous part of life, and, had it been otherwise, children might have become parents, and old women might have had children, when they were unable to supply them with proper or sufficient nourishment. Yet the rules just mentioned are not free from all exceptions. The catamenia, with powers of fecundity, have continued in particular instances much beyond the age we have specified. Some of these have had regular catamenia; in others, after a long suppression, the discharge has returned. We must be careful, however, here, as in the case of premature appearance, not to confound with the menses accidental and morbid hemorrhages. A relation of Haller's had two sons after her fiftieth year, and in colder countries, where the access of puberty is late, children have been born when the mother was even above 60.

The proper menstrual blood is generally preceded, sometimes even for some months, by a whitish serous fluid. Symptoms of more or less violence, indicating the accumulation of blood about the hypogastric vessels, such as pain in the loins and about the pelvis, lassitude with painful affection of the lower extremities, and various nervous and hysteric feelings, are then observed. Pains in the head, flushing of the cheeks, and even pimply appearances in the face sometimes take place. In younger virgins these symptoms are milder, and in the first instances often go off spontaneously: but they return with greater intensity, attended with considerable colic pains, and quick and strong pulse, until a bloody serum, and then more genuine blood flows more or less rapidly from the vulva. The duration of the flux is uncertain; it may be accomplished in three or four days, or be protracted till the seventh or eighth. The quantity is subject to no settled law: it is greater in warm countries, where it may amount to a pint or more; while in colder regions it does not exceed five, four, or three ounces. "Yet," says Dr. Denman, *lib. cit. p. 118*, "there is a common quantity, to which, under similar circumstances, women approach, and it may be estimated in this manner. Supposing the quantity to be about eighteen ounces in Greece, and two ounces in Lapland, there will be a gradual alteration between the two extremes, and in this country it will amount to about six ounces." Manners and way of life make a considerable difference. Luxurious and lascivious women have a more copious discharge: while those who take much exercise, or are weak or insufficiently nourished, furnish a more sparing quantity. The pain subsides as the discharge proceeds; the inflammatory symptoms about the uterus go off as the determination to that organ ceases, the pulse is diminished, and the blood is followed by a serous fluid. Signs of debility succeed, with a hollowiness about the eye, and a dark circle surrounding the organ. The first appearance in a young girl is generally followed by an interval of some months, and this period approaches gradually to a solar month; so that a healthy woman, in whom the discharge is established, will have it return on the same day of the month for many succeeding years. If seven or eight days are occupied by the flow of the catamenia, there is an interval of twenty-two or twenty-three, making up the menstrual period. Such is the course observed in healthy temperate subjects, whose bodily and mental powers are not abused or overstrained. Improper regimen and manners may precipitate or retard the discharge. Luxurious manners, with high living, may occasion returns after fifteen days: under various other circumstances there is a similar protraction of the period, which recurs however at regular intervals. Similar symptoms to those which attend the first menstruation, but in a milder form, accompany each return. In this respect considerable varieties are observed; the affection

recurring with considerable violence, at every period, in some women, while others do not seem to suffer at all.

The nature of the discharged fluid has not been ascertained by any accurate investigations, but its obvious characters are so exactly like those of blood, that it has been generally considered and called blood. This remarkable difference, however, at least, seems to distinguish the two fluids; *viz.* that the catamenia do not coagulate. They are blood deprived of fibrine. Coagula are sometimes seen, but are considered to denote unhealthy menstruation, as they occur when the process is obviously disturbed, and attended with great pain, &c. Opinions have been very generally received that the menstrual discharge possesses some peculiar malignant properties. These notions seem to have originated in the East; they appear in all their force in the ordinances of the Jewish legislator, were adopted by the Arabian physicians, and have been credited in most countries. The severe regulations which have been made in some countries, for the conduct of women at the time of menstruation, the expressions used, the disposal of the blood discharged, or of any thing contaminated with it, the complaints of women attributed to its retention, and the effects enumerated by grave writers, indicate the most dreadful apprehensions of its baneful influence. The following quotation exhibits these absurd notions in very elegant language. "*Penis cum menstruata concubantis excoriatur; si novella vitis eo tangatur, in perpetuum leditur; steriles fiunt tacte fruges; moriuntur insitæ; exuruntur horticorum gemina; si mulier prægnans alterius menstrua supergrediatur, aut illis circumlinatur, abortum facit; si autem, quæ ultro non gestat, concipiendi spem admittit; purgantis spiritus, et vaporab ore, specula atque choris nitorem obscurat. Gustatus hic sanguis canes in rabiem agit, homines vero diris cruciatibus affligit; conitalem morbum, pilorum efflavium, aliaque elephantiorum vitia inducit; idcirco a veteribus inter venena relatus; pari malignitate existimatur, atque sanguinis elephantici potus."* De Graaf.

Under peculiar circumstances of health, or states of the uterus, particularly in hot countries, if cleanliness be not observed, and the evacuation take place slowly, the discharge may easily become acrimonious and offensive. But there is nothing of this kind belonging to healthy menstruation in a cleanly woman, where the effused fluid differs from any other blood only in the circumstances already mentioned. Nay, when the catamenia are retained in the body for many months, in cases of imperforate vagina, they produce no ill effect whatever, and are distinguished by no particular odour or offensive quality when discharged by an operation. We have, therefore, no reason for thinking otherwise than that this discharge is of the most inoffensive nature.

That the catamenia come from the uterus is tolerably evident from the change in the lining of that organ during the period of their flow. Its mucous surface is rendered softer and more villous; and exhibits bloody spots, with numerous pores, from which the fluid may be expressed. The appearance of the menstrual blood in its cavity during the period is a further proof: to which we may add the suppression of the discharge in various morbid conditions of the uterus, and in pregnancy, where its surface is occupied by the adhesion of the ovum. Direct evidence of the fact is furnished in cases of prolapsus, where the fluid may be actually seen distilling from the os tincæ. To these arguments we may add the obvious connection of the menstrual flux with the functions of the uterus. Some have contended that the vagina is partly or wholly the source of the catamenia; but the opinion rests on no sufficient ground: the structure and function:

## GENERATION.

functions of the vagina, as well as the direct evidence of facts, strongly oppose the opinion.

Whether the menses come from the arteries or veins of the uterus has been a point of discussion with physiologists; and also whether it be a simple efflux of blood from the vessels or a secretion. The structure of the organ resembles that of glands, and the appearance of the fluid, on many occasions, differs widely from mere blood; which indeed it never resembles entirely in the healthy state; so that we are disposed to consider it as a secretion performed by the uterus like fluids that are formed by any other glands. A circumstance is sometimes observed in this process, which must be referred to the secretory action of the uterine vessels. This is the discharge of a membranous substance, of the figure of the uterine cavity, smooth on one surface, and flocky on the other, and much resembling the decidua on the whole. The fact is mentioned by Dr. Denman, who first saw it in married women, and afterwards in unmarried ones under circumstances which proved undoubtedly that it was formed independently of conjugal communication. The menstruation has been painful in all these cases, and conception has never occurred while the habit remained.

The efficient cause of menstruation has afforded an ample field for those who delight in speculations and hypotheses. As the periods of the moon agree nearly with those of the discharge, the influence of this body has been resorted to in explanation of the occurrence. If we admit the solution, the effect of lunar attraction ought to be very different in the various relative positions of the moon and earth: but the observation of several individuals will immediately shew that there is no day of the month in which several do not begin to menstruate, and that the moon's apogee or perigee has no influence at all in this respect. We shall see, too, that the discharge begins in some, is diminished or entirely ended in others, at the very same time; consequently that the moon can have nothing to do with the matter. Moreover, as the menstrual period rather follows solar time, the same woman menstruates at one time in the new moon, and at another in the full moon. The existence of some ferment, causing an intestine motion in the vessels of the part, meets now with no advocates. Local or general plethora have been assigned as the reasons of the menses, and many of the circumstances which accelerate or increase, or on the contrary retard and diminish the flow, favour these opinions. But we still cannot adopt the opinion; the loss of several times the quantity of blood previous to or in the very act of menstruation, from the arm, or any other part of the body, does not prevent or interrupt the flowing of the menses; and in those complaints which arise from their obstruction, greater relief is afforded by a few drops of blood from the uterus itself, than by ten times the quantity from any other part. A curious circumstance must be noticed respecting the effects sometimes produced by obstructed menses; *viz.* that their place is supplied by periodical emissions of blood from various other parts of the body, as the nose, lungs, ears, eyes, breasts, and almost every other part. These probably should be deemed in many cases rather as discharges belonging to some disease under which the patient may labour, than as connected with menstruation. Hemorrhages of every kind, in either sex, are frequently observed to be periodical.

That the catamenia are a secretion from the mucous lining of the uterus, of which we cannot understand the direct mechanism, any more than the method in which any other secretions are performed; and that we are ignorant of the causes which determine their appearance to the monthly period, seem to be nearly the sum of our knowledge on this

subject. It is clear that the process, being a part of the healthy operations of the organ, and therefore indicating its general condition, is necessary to preserve the uterus in a state fit for conception. Observation has fully proved that women, who do not menstruate from the uterus, or who are not in a state disposed to menstruate, cannot conceive, even though they should have a periodical discharge of blood from any other part of the body. All animals, at the time of their being salacious, or in a state fit for the propagation of the species, have a discharge, analogous and perhaps equivalent to menstruation, which is generally mucous, but in some instances, in any hot seasons and climates, becomes sanguineous.

That the menstruous blood contributes to the formation or nutriment of the fœtus may be reasonably doubted. The time of the discharge is not the most favourable to conception, which occurs most readily just after the period. Since all animals, whether they menstruate or not, supply the offspring of conception with nourishment of a proper kind, and in a sufficient quantity to bring it to perfection, we may conclude that the end is accomplished by some more common principle. The mucous discharge from the generative organs of animals, proves that they are in a state favourable to the propagation of their species, and the catamenia prove the same circumstance in women.

From the time when the phenomena of puberty announce the aptitude of the female for the exercise of her sexual functions, the generative organs exert an influence which modifies the whole organization, and bestows on woman the most striking traits of her physical and moral character. The various revolutions to which her constitution is subject, the nervous affections, the frequent returns of indisposition and suffering, the strange and unaccountable anxieties and caprices, and sometimes the increased acuteness of the imagination and judgment; all depend on this influence; and if it be true that man is male only at certain times, while woman is female during her whole life, it must be attributed chiefly to this cause. It is this that constantly recalls woman to her sex, and marks her whole existence with so characteristic a physiognomy. We shall not be surpris'd to find, that a cause of such power and extensive influence is liable to irregularities which have very marked effects on the constitution. When the new powers with which the organs are endowed exceed the just standard, and deviate into a kind of unnatural irritability, they affect sympathetically the whole frame, and particularly the nervous system. This, in an extreme degree, constitutes *furor uterinus*. Generally, however, this excessive vitality of the sexual organs; without going to such an extent, produces various spasmodic and nervous symptoms, constituting what are called hysterical disorders, and arising evidently from the artificial and forced state of celibacy. These affections are removed by marriage, which re-establishes the balance of the various functions by giving its natural employment to an organ, whose excessive sensibility deranged the whole system. Other and very various phenomena may be referred to the same cause; and those physicians who have collected, in particular works, observations on the diseases occasioned by celibacy, or by the imperfect and unnatural enjoyments of the cloister, present us with an alarming catalogue. "Ut reliqui stimuli a natura dati inobsequiosos puniunt, ita et veneris abstinentiam, ut nature inimicam, hæc ipsa ulciscitur. Ipsa animalia ex desiderio veneris languent et pereunt. Cyprini ex retentis ovibus laborant. In sacris ædibus, de quibus severa religio venerem arcet, multa, parum cognita, neque sanabilia morborum genera vigere idoneus auctor exultat. Frequenter cæ potissimum, quæ veneris dulcedinem degustarunt, quæ nunc privantur, in chlorosin, in hysterica mala, in convul-

siones,

siplas, in maniam, in furorem uterinum incidunt; quam nec femel vidi; inque earum feminarum apertis cadaveribus schirri, et steatomata, & hydropes ovarii reperiuntur. Quare, nisi morum custodia veterit, ea mala pleraque, et furor uterinus, et vera mania, veteris usu solvuntur." Haller, Elem. Physiol. t. 8. p. 14. We may affirm, in short, that from the time when the organs, which characterize these amiable and sensible beings, are fully endowed with all their vital powers, woman is constantly subject to their influence, until the period arrives when she is no longer capable of the life of the species, when she has passed through the revolution of her latter age, and enjoys quietly her individual life, during the remainder of which women differ much less, in every respect, from the other sex.

A delineation of the effects, which the physical changes occurring at the time of puberty produce on the moral character and ideas of women, may be seen in the eloquent work of Cabanis, "Rapports du Physique et Moral de l'Homme." The various morbid derangements of the menstrual process will be considered in the medical department of this dictionary.

The generative process is subject to very different laws in animals and in the human species. In the former, particular seasons of the year are appropriated to these functions, and the organs undergo certain physical changes, by which they are rendered fit for the process. It is a peculiarity belonging to the human race, that they are confined to no season in exercising these functions. Most animals, and particularly birds, copulate in spring: and that warmth has much influence in the affair is evident from this, that animals of warmer countries seldom copulate or are fecundated in Europe. Perhaps women conceive rather more frequently in spring; at least accoucheurs have observed that there are most labours in the months of December and January.

As the effect of sexual communication is so important, it cannot be indifferent to the design of nature to what part of the uterine system the semen should be conveyed. It admits of no doubt, that it either remains in the vagina, passes into the uterus, or else extends its course along the Fallopian tubes to be applied to the surface of the ovaries, which it stimulates, and from which the new animal derives its existence; but the question whether it be one or other of these, has given birth to more physiological controversy than perhaps any other operation of a living animal. Those who have entered the lists have ranged themselves either on the side of application of the semen to the ovaries, by means of the tubes; or on that of the inutility of this process. These latter contend for an absorption of this fluid by the vagina, and a peculiar excitement of the whole frame as a consequence, of which excitement the changes produced on the ovaries are to be regarded as the local effects. The advocates for the first opinion allege, that the semen has been seen both in the uterus and tubes, and quote as their authority the observations of Morgagni for the former, and Ruysch for the latter. When seen in this last situation, some have thought that it was conveyed thither by the muscular power of these parts, in the manner of a peristaltic motion, beginning at the uterus, and ending at the fimbriated termination of the tube; and when at this last, it was supposed that the semen was applied to the surface of the ovaries, and impregnated them by actual contact. Various analogies, drawn from the animal and vegetable kingdoms, have been adduced for and against these different opinions: but such arguments must be received with caution. Where different instruments are employed to produce the same ultimate effect, we may reasonably conclude that the means used are essentially different. On this principle no direct conclusions can be drawn respecting

the human species, from observations either on vegetables, or even on frogs, toads, and newts. The impregnation of birds, being effected by semen conveyed into the body, resembles that of the human subject more than the former; but they differ so widely in the mode of perfecting the fœtus from the ovum, that we cannot rest with much confidence on their general analogy.

To the observations of Morgagni and Ruysch a numerous train of facts has been opposed, ascertained by the experimental labours of Harvey, De Graaf, Haller, and others, in which no semen was ever seen beyond the vagina in animals, examined at various periods after coition. One experiment of Haller, on a sheep, constitutes a single exception to this observation: he once saw semen in the uterus forty-five minutes after coition. These facts bring the advocates for the necessity of a contact of semen with the ovaries into a dilemma, from which they attempt to extricate themselves by contending, that fecundation does not require the application of semen to the ovaries in a palpable form; but that there is exhaled from it a subtiler fluid in a vaporiferous state, called *aura feminalis*, and that the contact of this vapour is fully sufficient to impart to the ovaries their due quantity of stimulus.

The opinion, that the presence of the semen in the vagina alone was sufficient to account for impregnation, was defended by the statement of cases, in which, from some anatomical peculiarities, it seemed almost impossible that the fecundating fluid could be conveyed into the uterus; yet in several of these cases impregnation really took place. Those who hold a contrary opinion either cavil at the accuracy of the statement, or draw a different conclusion. In order to throw some light on this subject by direct arguments, Dr. Haighton undertook a series of experiments, the results of which are detailed in the 87th vol. of the Philosophical Transactions. He divided the tubes which form the cornua uteri in rabbits, and admitted them to the male, when they had completely recovered from the experiment; but this operation seemed to destroy entirely not only the power of conception, but also the disposition to employ the means. After several ineffectual trials, he varied the experiment by dividing one tube only, and in many instances the animals conceived afterwards. Corpora lutea were found on both sides of the body, but fœtuses only on the sound side. If the former bodies are produced only after conception, which the doctor assumes, then conception must have taken place here, although the direct access of semen to the ovarium was interrupted; for the operation in question completely obliterates the tube. It must be acknowledged that the proof is incomplete in these cases; we cannot justly assert that conception has taken place, when no fœtus was formed. Dr. H. attempts to elude this objection, by shewing that the division of the tube at any period after coition, but before the passage of the germs from the ovary, will equally prevent the appearance of fœtuses; accordingly no fœtuses were seen in the tube, when it was divided as late as forty-eight hours after coition. But if the operation be deferred until the time at which the rudiments of the new animal have passed into the tube, the actions of the parts suffer no interruption, and fœtuses are formed in the tube of the mutilated side. "If," adds the Dr. "the ovaries are susceptible of their proper excitement only from the contact of semen, how did it happen that the effects of that excitement were not more obvious where nothing had been done to intercept its course for 48 hours, than in those where all communication between the uterus and ovary had been cut off before the means of impregnation had been employed? I think it must appear, on tracing nature's

steps through the different stages of this work, that they are the product of that law in the constitution, which is called sympathy or consent of parts. That the semen first stimulates the vagina, os uteri, cavity of the uterus, or all of them. By sympathy the ovarian vesicles enlarge, project, and burst. By sympathy the tubes incline to the ovaries, and having embraced them, convey the rudiments of the fœtus into the uterus. By sympathy the uterus makes the necessary preparation for perfecting the formation and growth of the fœtus. And, by sympathy the breasts furnish milk for its support after birth."

Physiologists have certainly not yet ascertained, by direct observation, whether or no the semen enters the uterus and tubes; and consequently all explanation of the mode in which it co-operates in conception must be, in a great measure, hypothetical. If we cannot speak from actual knowledge on a point, which must be so important as the present, in the generative process, and the determining of which must be so essential towards forming right notions of the nature of the business, how uncertain must our representation be of the more intricate and obscure parts of the subject!

Haller's work furnishes us with the following account of "*quæ feminis in coitu accidant.*" *Primum voluptas est. Eam pleræque nullam fatentur, et etiam eæ, quæ possunt absque dedecore fateri, confirmant, se absque grato sensu concepisse. Sinciores aliæ et appetunt venere, et se ea delectari agnoscunt. Potest autem is sensus in alia et alia muliere major esse minorve. Cum ea voluptate congestio humorum ad partes genitales & calor conjungitur. Dixi osium internum uteri sentire. Clitoris sensu est acerrimo, sed in venere patum afficitur. Vaginæ columnas putes esse sensu acriori; neque carent papillis, ut neque vulvæ ostium, neque nymphæ. Potest in his partibus voluptas locum habere, et ab ea sanguis in organa genitalia concieri, ut caleant, turgent et aerius sentiant. Certum est tamen in iis puellis, quæ cum voluptate coeunt, vaginam tumescere, ut maritum propius amplectatur. Id potest partim muscoli sphincteris officio fieri, quem vis nervosa ad contractionem irritat, partim ex tumulentibus vasis plexuum venosorum, et corporum cavernosorum vaginæ et clitoridis."* *Elem. Physiol.* 8. p. 23.

The circumstances just described do not appear to be essential to the business of fecundation; they contribute to the important object of reproduction in a secondary manner. The strong desire implanted in all animals, and the physical gratification experienced in its indulgence, ensure the union of the sexes, and consequently the continuation of the species. The celebrated Spallanzani has given to the world a very interesting series of experiments, by which it is proved that impregnation in many cases may be effected by artificial means. He proved the first in the case of various amphibia, as the frog, newt, and toad: and afterwards in the bitch. He experimented on a spaniel bitch, which had before had whelps. He confined her very closely until she was in heat, and then proceeded in the following manner: "A young dog, of the same breed, furnished me, by a spontaneous emission, with 19 grains of seed, which were immediately injected into the matrix, by means of a small syringe introduced into the vagina. As the natural heat of the seed in animals of warm blood may be a condition necessary to render fecundation efficacious, I had taken care to give the syringe the degree of heat which man and dogs are found to possess, which is about 30°. Two days after the injection, the bitch went off her heat, and in twenty days her belly appeared swollen, which induced me to set her at liberty on the twenty-sixth. Meanwhile the swelling

of the belly increased; and sixty-two days after the injection of the seed, the bitch brought forth three lively whelps, two male, and one female, resembling in colour and shape not the bitch only, but the dog also from which the seed had been taken." (*Dissertations*, vol. ii. p. 250.) The experiment was repeated with success by Dr. Rossi, *ibid.* 476. We have an account of a singular trial in the human subject, made at the suggestion of Mr. Hunter. It was in an instance of malformation, where the urethra opened in the perineum. "Under these circumstances the person married. When he had connection the emission was complete, which proved that the testicles were perfect, but the semen always passed out at the perineum. The late Mr. Hunter was consulted to remedy, if possible, this inconvenience, and to enable the person to beget children. He advised that the husband should be prepared with a syringe fitted for the purpose, previously warmed; and that, immediately after the emission had taken place, it should be taken up by the syringe, and injected into the vagina, while the female organs were still under the influence of the coitus, and in the proper state for receiving the semen. This experiment was actually made, and the wife proved with child. On a subject of this kind it is proper to speak with caution; but, from all the attending circumstances, no doubt was entertained by Mr. Hunter, or the husband, that the impregnation was entirely the effect of the experiment." *Home on Hermaphrodites*, in *Philos. Transact.* for 1799.

Various circumstances have been enumerated, as proofs that conception has taken place; as peculiar feelings during coition, horripilation, and even stridor dentium, &c. Haller's sensible remarks on this subject seem to us to be nearer the truth. "*Hæc omnia quidem mihi nimia videntur, et difficillima expertu. Neque enim femina, dum maritum admittit, otioso est ad experimentum animo: neque, nisi longo abhinc tempore norunt fere se concepisse, quando jam ejusmodi phenomena de memoria elapsa sunt. A feminis certe, a quibus verum poteram expectare, nihil de horripilatione, neque de dolore potui discere.*" *Ibid.*

The opinions concerning the effusion of a feminal fluid by the female, and its mixture with that of the male, are altogether imaginary. That a mucous fluid is sometimes poured out in coition, from the apparatus already described in the external organs and the vagina, is undoubted; but this happens only in lascivious women, or such as live luxuriously; it consists merely of mucus, and is discharged externally, instead of passing into the uterus.

Circumstances do not admit of the internal changes which accompany and follow copulation and conception, being accurately ascertained in the human subject; and, consequently, these have been investigated in various animals. Mr. Cruikshank gives the following description of the parts in a rabbit at heat. The orifice and internal surface of the vagina are as black as ink from the great determination of blood. The ovaria had, under their external surfaces, a great number of black, round, bloody spots, somewhat less than mustard-seeds. These black spots are the calyces or cups which secrete the ova; they are extremely vascular; the ova themselves are transparent, and carry no visible blood-vessels. These calyces, on the expulsion of the ova, enlarge and become yellow, projecting above the external surface of the ovaria, and form the corpora lutea: a certain mark of conception in all quadrupeds, and in women themselves, whether the embryo is visible or not. The use of the corpora lutea is not yet made out; but the orifice, through which the ovum bursts into the Fallopian tube, is often extremely manifest, and always has a ragged border, as lacerated parts usually

usually have. The Fallopian tubes, independent of their black colour, were twisted like wreathing worms, the peristaltic motion still remaining very vivid; the fimbriae were also black and embraced the ovaria (like fingers laying hold of an object.) so closely and so firmly, as to require some force, and even laceration, to disengage them. Haller and other observers support this statement of the erection of the tube, and its close application to the surface of the ovarium. But Dr. Haighton seems not to have found it so until a later period. He examined a female rabbit in high season a few minutes after coition, and found the fimbriae in their natural situation. He found, moreover, from a regular series of observations made on different rabbits, at every hour between the first and the ninth, that the fimbriae remained nearly in their usual situation; and the only difference he noticed in the last hours was a greater turgescency of vessels, as if preparatory to some important action. That the prominent vesicles or calyces of the ovaria, already mentioned, burst, and allow something to escape into the Fallopian tube, which conveys it into the uterus, is what all observers seem to agree in: and they concur, moreover, in representing the corpora lutea as produced by a particular process carried on in the empty ovarian calyces, and consequently, as exhibiting incontrovertible proofs of impregnation having been effected. These circumstances have all been ascertained by the observations of animal bodies, and transferred by analogy to the human subject; in which, indeed, the formation of a corpus luteum is very evident, although the earlier stages of the process have not been traced. Observers by no means agree as to the time at which these changes are effected. Mr. Cruikshank represents the bursting of the calyces as following a fruitful coition very speedily. "I opened," says he, "a female rabbit two hours after she had received the male: the black bloody spots just mentioned now projected much above the surfaces of the ovaria, *some of the ruptured orifices were just visible*; but in many of these spots there was not the least vestige of an orifice; whence I conclude that they heal very quickly in general." The narrative of Dr. Haighton's experiments would lead us to conclude that this escape of the germs from the ovarian calyces does not take place till a much later period. In twelve hours after coition "several of the vesicles evidently projected; they had lost their transparency, and were become opaque and red. When punctured a fluid of the same colour escaped. The corpora lutea, which are formed by the thickening of the parietes of the vesicles, were not very evident." At 24 hours after coition the fluid in the vesicles was similar to that of the last experiment. They projected more evidently, and their thickened parietes, manifesting the commencement of corpora lutea, were become more apparent. At 48 hours past coition, *the vesicles seemed to be in the very act of bursting*, and a semi-transparent substance of a mucus-like consistence was beginning to protrude from some of them; others, indeed, were less advanced. The fimbriated extremities of the Fallopian tubes were preparing to receive their contents, as appeared by their having quitted their usual position, and embraced the ovaries in such a degree, that only a small portion could be seen until the tubes were taken away. Sections being made into the thickened vesicles, the formation of corpora lutea appeared to have made further advances. From the appearance of an incipient rupture of the vesicles in this experiment, it was but reasonable to expect that their contents would soon have escaped. In two days and twelve hours after coition the fatal rudiments had escaped; but the cavity of the ovarian vesicles had suffered but little diminution. Bristles were easily introduced by the ruptured orifices. In this experiment the advances to-

wards the formation of a perfect corpus luteum were such as the period of examination would naturally lead us to expect. The contents of the vesicles having escaped, it was but reasonable now to look forwards to a speedy obliteration of the cavity. I therefore examined these parts, under similar circumstances, on the 3d, 4th, and 5th days. In the last experiment there was but little vestige of cavity, consequently the corpora lutea might be considered as perfectly formed."

That a something, which is the germ of the future animal, and is supposed to be of a vesicular figure, escapes from the ovarium after conception, is received into the Fallopian tube, and conveyed by it into the uterus, is rendered highly probable by the facts just related: and various additional proofs may be adduced on this subject. Almost the whole animal kingdom possess ovaries, in which the rudiments of the future being are obviously contained previously to impregnation; and it is the development of these rudiments after impregnation that forms the future animal. The formation of the germ in the ovary, and its passage into the oviduct, are particularly clear in birds and reptiles; and analogy strongly leads us to assign to the ovaries of the mammalia the same function of producing these germs. The removal of these bodies renders the woman completely sterile; and Mr. Hunter has shewn that the extirpation of one has a very marked effect on the fecundity of the animal. In the Philosophical Transactions for 1787 he has detailed the result of "an experiment to determine the effect of extirpating one ovarium on the number of young produced." He selected two fows of the same colour and size, and one boar from the same farrow, and removed one ovarium from one of the fows. About the beginning of the year 1779, they both took the boar; but the one which had been spayed earlier than the perfect female. The distance of time, however, was not great, and they continued breeding at nearly the same times. The spayed animal continued to breed till Sept. 1783, when she was six years old, which was a space of more than four years. In that time she had eight farrows, consisting of 76 pigs; but did not take the boar afterwards. The perfect animal continued breeding till December 1785, when she was about eight years old, a period of almost six years, in which time she had thirteen farrows, consisting of 162 pigs. "From this experiment," says Mr. Hunter, "it seems most probable, that the ovaria are from the beginning destined to produce a fixed number, beyond which they cannot go, though circumstances may tend to diminish that number; that the constitution at large has no power of giving to one ovarium the power of propagating equal to two; for, in the present experiment, the animal with one ovarium produced ten pigs less than half the number brought forth by the pig with both ovaria. But that the constitution has so far the power of influencing one ovarium, as to make it produce its number in a less time than would probably have been the case, if both ovaria had been preserved, is evident from the above recited experiment." Certain irregularities in the process throw much light on the subject, and tend to strengthen the argument just adduced. Fœtus may be detained in the ovarium, and developed there to a certain point. Or, the germ may escape from the ovary, and not be admitted into the Fallopian tube; in which case it has often become attached to some part of the abdominal cavity, instead of the uterus, constituting what is termed a ventral extra-uterine fœtus. After it has attained a certain degree of development, labour pains come on, but parturition cannot be effected; and the bones of the child are, perhaps, discharged through an abscess, or gain admission into the alimentary canal, and are



voided per anum. Lastly, the germ may be detained in the Fallopian tube, without arriving at the uterus. The structure of the part does not allow it to dilate sufficiently to contain a full-sized child, and it accordingly bursts, in general, long before that time, and the patient perishes from bleeding.

We must allow, that the escape of any thing from the ovarium in the human subject, or other mammalia, is rather inferred than directly proved; and that we cannot see the germs in the Fallopian tube, on their passage to the uterus; in so obscure a state are the rudiments of the future animal at the time, and immediately after conception.

We have represented the corpus luteum as the consequence of a fruitful copulation; but there is some doubt whether the latter circumstance be an essential condition of its production. It is well known that birds lay eggs, without the concurrence of the male, and such eggs are unproductive. Valisneri asserts, that he has seen corpora lutea in the ovaries of virgins; and Blumenbach appears, in the following quotation, to agree with him in opinion on the subject. "Porro autem non minus verum est inuertas aves ejusmodi ova subventanea ex mechanica titillatione genitalium concipere posse, quod quidem physiologie comparatæ, adeoque omnis zoologie vere scientificæ parens Aristoteles, et preterito seculo oculatissimus Harveius animadvertit, quorum hic adeo libidinosas interdum aves esse asseruit, ut si dorsum earum manu solum leniter tangas, statim procubant, et orificium uterinum nudent et exporrigant, quod si blande digito demulseris, vago murmure, alarumque gesticatione, gratam veneris dulcedinem eisdem exprimere; quin etiam femellas ova inde concipere, in turdo, merala, aliisque se esse expertum. Idem de plittaco refert, quem uxor ejus diu in deliciis habuerat, sæpe hunc ludibundum et lascivum sedentis gremium adiisse ubi dorsum sibi demulceri gestiverit quassatisque alis et blando strepitu summam animi sui lætitiã testatus fuerit. Non diu autem post blandas has contrectationes eundem ægrotasse, crebrisque tandem convulsionibus obortis exspirasse. Dissecto itaque cadavere ovum fere perfectum se in utero ejus reperisse; sed, ob defectum maris, corruptum. Ignoscunt mares istarum virginum, si lutea in earum ovarii corpora non absumilem originem agnovisse suspicor; utpote qui in puellari corpore, non minus quam in tardis et merulis eundem æstri veneris in ovarii vesiculas effectum esse reor, sive is viri amplexu, sive lesbio quodam artificio excitatus. Quadrant in eam suspicionem, quas diximus circumstantiæ, sub quibus corpora lutea in inuertiis observantur auctores; ætas scilicet, a decimo quarto inde anno, hysterica quarundam affectio, &c. Num climati quoque aliquid tribuendum, decidere non audeo, annotans tantummodo, quotquot mihi hæcenus apud auctores occurrunt ejusmodi haud inficiandi casus, eos non nisi in Italicis virginibus observatos fuisse." *Specimen physiologie comparatæ*, Goetting, 1789, p. 4—9.

Physiologists have questioned whether a second impregnation can take place after a fruitful copulation. Instances of twins, born with different degrees of development, have been considered as proofs of superfetation. The reasoning does not seem very conclusive, the fact does not clearly prove that the two fetuses were conceived at different and distant periods, since the growth and development of one germ may have been prevented by various causes. The question is, whether a woman, having only a single uterus, can conceive two or more months after a fruitful copulation; and at present we have no facts to prove the affirmative, while pre-emption is strongly against it. The thing appears more easy, if we suppose the two conceptions to be separated by a very short interval. Thus we can conceive that the Ame-

rican lady mentioned by Buffon, who received the embraces of her husband, and of a negro slave, in the same morning, may have brought forth twins of different colours.

On the subjects of the preceding paragraphs, the reader may refer to the ample collection of facts, in the eighth volume of Haller's *Elementa*; to Spallanzani's dissertations relative to the natural history of animals and vegetables, vol 2d.; to Haighton's experimental inquiry concerning animal impregnation, in the *Philosophical Transactions* for 1797; to Cruikshank's experiments, in which, on the third day after impregnation, the ova of rabbits were found in the Fallopian tubes, and on the fourth day after impregnation in the uterus itself, with the first appearances of the fœtus; *ibid.*

The various opinions concerning the source from which the new animal is derived, and the manner in which its formation is effected, form the last subject of the present article. In the science of life, as in all others, the speculations and hypotheses concerning any matter are in an inverse ratio to the number of ascertained facts; and persons are disposed to talk more, in proportion, as they know less. Hence the vast abundance of theories of generation, which almost exhausted the patience even of Haller, and extorted from him the following very sensible observations. "Iterum ingratiſſimum mihi impendit opus, scribere de iis, quæ multis a natura circumjectis tenebris velata, sensuum luci inaccessa, hominum agitantur opinionibus; erit de iis ferenda sententia, in quibus quod displiceat, quod infirmum sit, ubique se offert, id autem parcissime, in quo animus, tanquam in firmo aliquo fundamento, adquiescat. Erunt libranda cum phænomenis contraria phænomena, cum argumentis contraria argumenta, ut demum nihil doceam certius, quam nihil me docere. Et est tamen etiam in desperatione de problematis solutione sua utilitas, proximumque est vero, nihil docere, quod falsum sit." The first subject of our inquiry will be, from what quarter the materials of the new animal are derived; then, by what causes these materials are formed into an animal, such as we have shewn to be produced in the female by conception. The opinions concerning the source of the offspring may be reduced to three; one gives to woman only the humble office of affording a proper nidus for the due evolution of the fœtus, which, according to this theory, already exists in the male semen, and requires only a fruitful habitation. Another directly reverses this position; it puts the female in possession of every requisite for the formation of a new animal, and considers the male a mere stimulating engine, to call the latent powers of the female into life. The third gives not pre-eminence to either sex, but, with the mutual embrace, supposes a mutual effect to be produced; it regards both the male and female, as concurring essentially in the work of reproduction, by each affording a something, which, when united under proper circumstances, becomes the proximate cause of impregnation.

The ancients admitted a feminal liquor in both sexes, and concluded, not unnaturally, that the fœtus was formed by the union of these. Hippocrates and Aristotle held this opinion, and conceived that the sex of the offspring depended on some predominance in quality of one or the other fluid. However obscure the mode of this mixture may seem, specious arguments are not wanting in support of the opinion. The necessity of the co-operation of the two sexes, in producing a fœtus, in almost every instance in the animal kingdom, may be alleged in favour of the doctrine. Also the existence of different sexes in almost all plants; the fecundating power of the male dull, and the perpetual remains of the seed before fecundation; which, however, remains unfruitful without the influence of the former. The resemblance



blance of the fœtus to both parents in the human race, in animals and even in plants, may be urged in support of the same doctrine.

The old opinion, which supposes that males are produced by the right testis and right ovary, and are contained in the right side of the uterus, while females are formed on the left, is destitute of all foundation. A male with one testis has produced children of both sexes; and male or female fœtuses are seen indifferently in the right and left cornua uteri of animals.

The hypothesis of Hippocrates and Aristotle was adopted by Buffon, and is presented in his natural history with all the advantage it can derive from his warm imagination and eloquent diction. But figurative language recompenses us very imperfectly in scientific matters for want of observation, and hasty generalizations; and the theory of Buffon is so destitute of foundation, that we can hardly think it worthy of notice. He conceives that there is a matter in nature, composed of incorruptible molecules, always living and active, and destined to the nutrition and evolution of all organized beings. These particles are received in the food, and are applied to every part of a plant or animal. Every animal is an interior mould, by which these particles are fashioned to their particular shape. When there is more of this matter than is required for purposes of nutrition, the overplus is conveyed from all parts of the body to the testicles of each sex, which are its reservoirs. It exists here in a liquid form, and contains molecules analogous to all parts of the frame, sufficient to form a smaller being, exactly similar to the large one, from which it is produced. The molecules composing the new being are analogous to those of all parts of the body, from which they have been conveyed to the testes, and may be deemed a kind of extract of the old body. This matter, having passed through the interior mould, and finding the uterus in a favourable state, generates a new animal. We shall not abuse our reader's patience by the further detail of such vague chimeras; they more than justify the sarcasm of Voltaire in his "Homme aux quarante ecus." "Ah! monsieur le favant, says the man aux quarante ecus, could not you inform me how children are made? no, my friend! replies the favant; but I will tell you what philosophers have imagined on this subject, or, in other words, how children are not made." This jeu d'esprit contains a lively ironical account of the various theories of generation, which the reader will find much more entertaining, and quite as instructive as the original accounts of these reveries.

Of those, who consider that the father has the principal share in producing the child, Leeuwenhoeck is the foremost. He considers the spermatic vermiculi as men in miniature; and conceives that one of these crawls in some way or other into the ovarian vesicle, and is there developed.

That the fœtus is produced by the mother has been more generally supposed; and seems more probable on the first glance, since the child most certainly comes from the mother, although it is by no means clear that it ever went to her from the father. The analogy of almost all animals, and of plants, favours this opinion. The generation of the aphides has been adduced in its support; where a single fecundation suffices for several generations. In the frog and toad, and in the bird, it is very clear that the fetus pre-exists in the ovarium; and that the contact of the semen produces at first no perceptible change in its appearance. Indeed the wonderfully small portion of fecundating fluid necessary to produce the requisite effect in the frog or toad would lead us to con-

clude that I cannot excite any very great change at the first moments of its application; and this circumstance, together with the obvious existence of the something, which is afterwards evolved into a tadpole, in the ovarium before copulation, clearly proves the pre-existence of the germ in the females of this species of animals. "A quantity of seed," says Spallanzani, "far more inconsiderable than we should ever have imagined, is sufficient to animate a tadpole. We have seen that it is not necessary to cover the fœtus completely with this prolific fluid: a drop will suffice. Further, three grains mixed with twelve, and even with eighteen ounces of water, communicate to every part of it the power of fecundation, since tadpoles placed in any part of the mixture are fecundated. The three grains of seed must therefore have been diffused through the whole mass of water. But, what an enormous division of its particles must such a diffusion occasion! How small a share of proline liquor must fall to the share of each tadpole! Yet there are facts which prove that the semen still retains its virtue after this excessive division; for I have found a globule  $\frac{1}{500}$  of a line in diameter, taken out of a mixture of three grains of seed with eighteen ounces of water, was often capable of fecundating a tadpole. Desirous of knowing the proportion, which the tadpole (that of a frog is  $\frac{2}{3}$  of a line in diameter) bears to the particles of seed diffused in a drop of this dimension, I have found, on calculation, that it is as 1064777777 to 1. How infinitely small, therefore, is the quantity of seed in comparison with the bulk of the fœtus, which it fecundates! This deduction led me to calculate the weight of the particles of semen dispersed in this drop of water: it is  $\frac{1}{1064777777}$  of a grain. That I might view these particles under every possible aspect, I reduced their bulk to cubic lines, when it appeared to be about equal to  $\frac{1}{3000000000}$  of a cubic line." *Dissertations*, vol. ii. p. 212. The researches of Haller, and of others on the formation of the chick, have clearly proved the pre-existence of the fœtus in the female of birds.

But, although this hypothesis appears to be supported by the most numerous and satisfactory proofs, there are difficulties opposed to its adoption. "It is very certain," says Haller, "that children often resemble the parents in the human race; so that you may distinguish one brother by his resemblance to another, or know a son by his likeness to the father or mother, or even grandfather or grandmother. All the individuals of some families are characterized by particular lines of countenance. My own family have now been distinguished for tallness of stature for three generations, without excepting one out of many grandsons descended from one grandfather. Families of red-haired persons are not uncommon: the disagreeable colour being derived from the father or mother or grandmother. But this resemblance of children to parents is discerned most plainly when there is any defect or peculiar formation transmitted from one to the other. The transmission of disease may perhaps not be deemed so surprising, since nobody denies that the mass of fluids is derived from the mother; but the father contributes the smallest drop possible, if any. Yet we find various diseases, or dispositions to disease, passing from either parent to the offspring. This is matter of common notoriety with respect to gout, rheumatism, insanity, scrofula, consumption, &c. but there is more doubt of some others, as cataract, hernia, aneurism, squinting, harelip, clubfoot, fatuity, &c. of which, however, authors relate many examples. We know a very remarkable instance of two noble females, who got husbands on account of their wealth, although they were nearly idiots, and from whom this mental

defect extended for a century into several families, so that some of all their descendants still continue idiots even in the fourth and fifth generations. Perhaps the resemblances of the mother are rather the most common. The ill-made Persians have improved themselves into a very beautiful nation by their repeated marriages with the celebrated Georgian females. The offspring of Negroes and Europeans partakes of the characters of both parents in colour, form of the lips, nose, &c.; and we may observe in general, of all such mixed breeds, that the children produced seem to constitute a mean between the father and mother. Peculiarities of formation are not uncommonly transmitted; as a very hollow palate, which I myself have seen, and many others. A man covered universally with hard, elastic, cylindrical, warty excrescences, begot sons and daughters with the same deformity. An excess in the number of thumbs (four) passed from the father to the children: and there are curious examples of similar facts in individuals possessing five fingers on each hand. Pliny mentions that Q. Horatius, who had this structure, begot two daughters resembling him in this respect. A family mentioned by Reaumur is more remarkable: the grandfather had a supernumerary finger on each hand, and a toe on each foot. His first son produced three children with the same peculiarity: the second, who had the usual number of fingers, but in whom the thumb was very thick, and appeared as if composed of two united together, had three daughters with the supernumerary members: the third had the natural structure. A daughter, with a very thick thumb, brought forth a boy with the additional finger. That too much influence may not be attributed in this case to the influence of the male, it may be observed that another daughter, who had large thumbs, produced some sons with supernumerary members. Maupertuis has also recorded a family of children distinguished by this character, produced by a mother with the same peculiarity. The thick lip in the Aultrian family was introduced by the marriage of Mary of Burgundy with Maximilian. It is asserted that casual mutilations, as blindness, &c. have been transmitted to the offspring, in horses: and some complain of the plan of employing Arabian stallions rather than mares for improving the breed. There is a peculiar breed of four-horned sheep, descending from the female; and another of pigs with undivided hoofs. The difficulty of the subject is increased by the circumstance that these defects and peculiarities do not in general pass to the offspring. Blind, lame, or mutilated parents have perfect children. In the family with the supernumerary fingers, already mentioned, several individuals had the ordinary formation. Fowls without the rump breed with the common kind of chicken, both with and without that particular formation; and the same mother has children like herself and the father, and others without such resemblance." *Elementa Physiologie*, lib. 29, sect 8.

The phenomena afforded by hybrid generations are curious. It is only in the case of animals very nearly allied in their general characters that any hybrid offspring is produced: and this has the mixed characters of both parents. The relations of women in Africa breeding with monkeys are not sufficiently authenticated. "The mule (produced from the mare by the ass) does not," says Haller, "seem to me to be an ass, which however it resembles in its tail, ears, and obstinacy, since the form of the body, the strength and size, the hoofs, the hair, and colour are those of the mother. The voice is more like that of the father, and there is a farther resemblance of the ass in the peculiar hollow of the larynx. As the mule seems to be stronger and more lively than the ass, so the hinny begotten by the stallion

on the she-ass, seems rather to follow the mother: it is said to have the ears of the horse, the mane and tail of the ass; and to be smaller than the mule. The offspring of the common she-goat with the Angora he-goat has the long hair of the father; while that of the Angora female with the European male has not that character. The fine hair of the former breed was continued in Sweden to the third generation. This fact shews the prevalence of the male, which, being born in a warmer region, exceeds in stature the European animal. The pheasant breeds with the common hen: the offspring has the mother's colour, with the form of the father, whom on the whole it most resembles. If the animal produced from such a connection breeds again with the male pheasant, the young are complete pheasants. When these and various other analogous facts are compared, we remain in as much doubt as before. It appears that the offspring is affected by both parents, in some cases more by the father, and in others more by the mother. And I think, that where the father is greater in size, his characters prevail, and *vice versa*." *Ibid*.

Neither is it merely the form and external appearance that are changed in the cases of hybrid animals; we have already observed that the mule has the peculiar laryngeal cavity of the ass; and it is further known that this animal, and all other hybrids, very rarely propagate: so that we may conclude that some general internal change is effected in these cases. A more accurate anatomical description of hybrid animals would probably contribute to illustrate the subject: the facts at present in our possession lead us to conclude that the fetus is not produced entirely by the mother or father, that both parents contribute something to the offspring, and that the new being is rather generated *de novo* than evolved.

In considering the powers by which the admirable structure of the animal frame is raised, we encounter a vast host of the most wild and visionary hypotheses: we descend, to use the expression of Haller, from twilight into regions of utter darkness. In the first place we reject entirely the operation of fortuitous causes: the notions concerning equivocal generation have been sufficiently refuted by modern naturalists, even in the lower orders of animals, where the phenomena, on a superficial view, tend to confirm the vulgar opinions, and there is not even the shadow of probability in favour of such explanations in any of the higher classes.

In these times, however, men of considerable reputation have not been wanting to defend opinions very much resembling the hypothesis of equivocal generation. Buffon has contended that all the parts of an animal are not formed at once, but successively, by epigenesis. His observations concerning the organic molecules of the semen have been already noticed: he even admits the formation of new beings by putrefaction and by the fortuitous concurrence of particles. His associate, Turberville Needham, does not allow of equivocal generation, but supposes the existence of a power, which forms the body from the smallest germ by the assimilation of aliment. He thinks that the primitive germs alone are created at once, but that there are no compound germs at all resembling animals. He quotes the phenomena observable in vegetable infusions; and conceives that animal and vegetable substances are the same in their origin, and admit of being changed into each other. The first germ of an organized body is very simple, and not yet organized, nor possessing any lineaments of the animal. Hence the smallest animalcula, as consisting of the fewest germs, are formed the soonest; and those of a more compound structure, more slowly. The whole affair of vegetation consists of an expansive force residing in matter, and a resisting power. The former is perfectly elastic, and exi-

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in every sensible point of matter; it is assisted by heat. There is a power, in every point of vegetable matter, to produce filaments, from which microscopic animalcula may be formed. A real generating cause exists in nature. The expansive force is increased, and the resistance diminished, when matter is elevated to a state of vitality. This is effected by the development of the active principles; it returns again to a vegetable nature, when the contrary causes obtain. He does not, however, admit of equivocal generation, but conceives it necessary, that the seminal fluids, both of the male and female, characterized by their peculiar properties, should be present.

In this hypothesis the power of the semen is not neglected, nor is any attraction or fortuitous concurrence of atoms admitted. But the experiments on infusion animalcula are employed to authorize conclusions, which cannot be very easily admitted. We find a great difficulty in admitting how any blind force, not regulated by design, can form animals designed for certain purposes, and fit to fill their place in the chain of beings. Hence we find that these animalcula are not produced when the experiments are so conducted as to remove all possibility of the introduction of ova from without. The experiments of Spallanzani clearly prove this point.

The system of epigenesis met with an able defender in C. F. Wolf: see his *Theoria Generationis*, Halle, 1759, 4to. He explains the mode of growth, and the formation of parts in animals and vegetables, by the action of a power which he calls *vis essentialis*, without any mould or model. This power, together with the fixation or coagulation (*foli descendentia*) of juices, accomplishes the whole work of formation. The heat of the air in plants, and the heat in animals, are accessory causes of generation. The primordia of animals are globules, which cannot be reduced into smaller component parts; neither arteries, veins, nor heart exist in the egg at 24 hours. The *vis essentialis*, different from the power of the heart, now begins to act, and, in the globular matter of the area umbilicalis, forms grooves, which gradually grow red, and constitute vessels. These at first are large intervals of the globular matter, but gradually become smaller. Membranes are formed round these passages. All parts are first fluid and inorganic, and then formed into vessels. Trunks are formed to the branches, and at last the great trunk of all, the heart. New parts are formed, from the juices of the first; and thus the organs appear in succession, one after the other. Haller refutes this theory from his accurate observations on the formation of the chick; he shews that in fact parts exist, distinguished by their form and other characters, when superficial observation would lead us to infer that there was only an inorganic homogeneous mass. The transparency of the whole prevents the outlines and distinction from being visible, but coagulation by acids brings these differences into view. Because the original gelatinous mass, which forms the animal, seems to have no obvious structure or smaller distinguishable component parts, we are not therefore to conclude that it has none. Spirit of wine, poured on this jelly, hardens it so, that we can see fibres, vessels, and viscera, where there seemed at first to be a mere transparent concrete. There is no essential power in the alcohol to model rude matter into an organic structure; but the destruction of the transparency allowed the outlines of parts to be distinguished: similar explanations may be given of all his observations on this subject. Moreover, we can by no means understand how this single power can form such different parts always in the same place in one animal, and according to one archetype, if the materials be inorganic, mutable, and susceptible of any configuration. Why should this matter always produce, without any error, a chicken in the common fowl,

a pea-chick in the pea-fowl? Nothing is assumed but a dilating force acting progressively; this might give origin to a vascular net-work, growing constantly larger as long as the expansive force exceeded the resistance; but how does it produce a heart, a head, brain, and kidneys? Why is a peculiar order of parts formed in each animal?

Some again have explained the formation of the body according to mechanical principles, by the power of fermentation, &c. We cannot, says Haller, conceive that any power, unless guided by intelligence, can act on matter in a manner constantly changing, and so directed, that inorganic materials are formed into bones, muscles, vessels, and viscera, arranged in a certain order with respect to each other. All spontaneous productions, as for instance the beautiful figures seen in snow, are arranged in an uniform and invariable manner. Let any person, in order to estimate the value of such hypotheses, reflect merely on the eye. How can this organ be moulded by any expansive force into such various successive layers, all differently fabricated, where the light passes through transparent bodies, every where surrounded by others perfectly opaque, and so arranged, that in the millions of men and animals the rays of light constantly converge upon the retina? Yet this blind material cause knows nothing of light, nor of the laws by which it is refracted, although we must suppose it to have adapted all the parts so accurately, even to the hundredth part of a line, in order to the collection of the rays in the retina. Again, this unintelligent cause has furnished the eye with eye-lids and eye-brows, and has given to the iris a power of contraction and dilatation, by which the organ is accommodated to too great or too small a quantity of light.

Buffon supposes the nutritive matter to penetrate all parts of the body, and to be formed in them, as in an internal mould; and he conceives that the superfluous particles are carried back to the semen, conveying into that fluid every thing necessary to the production of a new being, similar to the former. The seminal fluid of either sex contains the particles necessary for forming an individual of the same sex.

These must be mixed for the production of a new being. The generative organs are the basis of the new animal, and these are first formed of themselves: the other organic particles of the body are arranged round them as a centre, according to the order, which they held in the body, from which they were produced. That sex prevails, of which the particles are the most numerous. The author of this hypothesis considers that it explains completely the resemblance of the offspring to either or both parents, the formation of twins, &c.

The illustrious name of Buffon can hardly induce us to animadvert seriously on such dreams. In the first place, what is an internal mould or model? The authors of the hypothesis are so far from satisfying us on this fundamental point, that they confess we could not understand it, unless we had a seventh sense. How then came they to know it? So far from understanding what this model is, we have no hesitation in asserting that its existence is purely ideal. But if we should grant this, there are still insuperable difficulties remaining. Many children are unlike both parents, and they sometimes have parts which both the father and the mother wanted, and with which, therefore, neither parent could have supplied them; this is the case with the offspring of mutilated individuals, and particularly with the male children of fathers who had lost one testis; a case which was not uncommon when castration was an ordinary mode of treating raptures. The mother cannot bestow on her daughter the hymen, which she has lost; nor can we see the source from which the foramen ovale, the ductus arteriosus, and venosus,

the umbilical vessels, the placenta, the cord, &c. are derived. The teeth too must puzzle us greatly. The various transformations, and every other phenomenon in the lower orders of animals, are altogether irreconcilable with the hypothesis. The adult frog has no branchiæ, which are yet seen in the tadpoles. In the bee kind, the males, females, and working bees differ in structure. The offspring might resemble the father or mother, but whence do the working bees come, which resemble neither parent, and have no generative organs. How entirely does the caterpillar differ, in all points of its organization, from the butterfly! How can the particles unite, when the male and female are so entirely different, as in the case of many insects, where one is winged, and the other not, &c.

The supposition of the successive fixation of parts round the generative organs is quite inadmissible; for those very parts cannot be recognized until a comparatively late period, and after others have been some time formed.

This fact was confirmed, says Blumenbach, by an observation which I lately made on abortive twins of different sexes, about sixteen weeks old. Although these were remarkable for the beauty of their proportions, and were most perfectly formed according to the standard of their tender age, the difference of the sexual organs could be ascertained only by the most careful investigation: in every other respect, as in the figure, physiognomy, measurement of the lines, &c. they resembled each other completely. *Institut. Physiolog.* p. 387.

In reply to some of these objections it has been affirmed, that those parts of the fœtus, which the parents have not, are formed by intelligent nature from the superfluity of the organic molecules: that she adds a second testicle from the excess furnished by the single gland of the father; and that the placenta and fetal coverings are produced in the same way from the excess of nutritious molecules; but if nature can make wings, intestines, nerves, feet, testes, placenta, and membranes, &c. without any mould, why should she not form the whole body in the same way: and, whence arises this abundance of particles, produced by the testis of a man, who has only one gland, when the mould must be one half less than in a perfect individual? How came this intelligent nature to be so suddenly produced in a mere machine, when we had before heard nothing of her? Can any one understand how particles transmitted from so vast an extent as the father's whole body, can occupy so small a space, even when united to those of the mother, as to be invisible for several days after conception? In short, there is no female semen, no corpus luteum before copulation, and consequently no fluid from the mother to be mixed with that of the father, and convey to the fœtus the female generative organs, the mammae and the other distinctions of the female sex.

A very different theory from that which we have just considered, and a very old one, ascribes the formation of the fœtus to a formative power of the mind or soul (*anima fructrix, vis plastica*): and some conceive that the object is effected by the mind of the fœtus. The partisans of these opinions rely much on the effects said to be produced on the body of the fœtus by causes operating on the mother's mind. They alledge that the structure of the offspring is often materially changed and impaired by the longing of the mother, or by various violent emotions: that these effects are produced, not from any corporeal cause, but from the action of the mind on the *anima fructrix* of the fœtus: that there is a harmony between the mind of the mother and her body, and between the bodies of the mother and child. Various attempts have been made to explain the manner and nature of this influence and con-

nection. But it would have been better to have established the fact incontrovertibly in the first place. The records of medicine abound with instances of almost all imaginable effects produced on the fœtus from the causes above-mentioned:—of the likeness of fruits or flowers, &c. on the body, of various animals, of bruises;—of parts being cut, destroyed, or otherwise injured, &c. &c. That credulity and ignorance have given birth to most of these narratives, cannot be doubted. Our faith in them must be most seriously shaken, when we observe that there are endless examples of the most vehement mental disturbances, as terrors, longing, passion, occurring repeatedly during pregnancy, particularly in delicate and hysterical women, without any thing unnatural appearing afterwards in the child, even when the mother has expressed her strong persuasion that her child would be mutilated. Nor can women forget when the marks above alluded to (*nævi*) will appear. Deformed and monstrous children, and others marked with *nævi*, have been repeatedly observed by the most judicious and accurate observers, when the mother was not conscious of any such cause as those above alluded to. Children are born blind of healthy parents without the circumstance being considered as extraordinary or requiring any thing accidental to account for it. When women observe any deformity in their offspring, they recur to their memory every thing which has happened during their pregnancy; and if they can remember any fall or fright, or suddenly seeing any uncommon animal, the carcase of a beast opened, or a wound, &c. they immediately set it down as the cause of the phenomenon. And, from the various turns which superstitious and whimsical fancies take in different countries, the same appearances are ascribed to very different causes.

In weighing the testimonies of authors, we shall find that the most experienced and judicious indulge the common notions about *nævi* much less than others. In the numerous collections, where monsters and extraordinary productions of all kinds are carefully collected and preserved, we see no example of a genuine *nævus*, according to the common notions, that is, of the resemblance of a sausage, or a pig's foot, or a wound, &c. in any part of the body of a fœtus. In further support of our opinions we may quote the numerous instances of monsters, vegetable productions, which cannot be ascribed to any power of imagination, or any mental affection whatever. We cannot doubt that the seed and the ovum contain the cause of the future structure, which is always preserved uniform in the same species. That various external circumstances, as a copious or deficient supply of nutrition, and many causes of a nature entirely unknown to us, may have an effect in altering or variously modifying the original fabric, within certain limits, we do not pretend to deny.

If the phenomena of *nævi* afford no proof of a plastic soul; if we acknowledge that the beautiful structure of an animal body cannot be reared by chance, nor by any blind force with which inorganic parts may attract each other, it remains for us to consider whether the fœtus is formed before the time of conception, according to the hypothesis of evolution. This opinion has been chiefly held in modern times: it is ably defended by Haller, and has been supported by the experiments and writings of Spallanzani and Bonnet.

If, says Haller, the germ or original of the fœtus be contained in the mother, if it be already formed in the ovum, and so far perfected as to require merely a supply of nourishment for its growth, the grand difficulty of forming such an artificial and complicated structure from inorganic matter is overcome. In this hypothesis, the Creator,

with

with whom nothing is difficult, forms the machine: he has arranged dead matter, in conformity with his previous designs, and according to the archetype fixed by his wisdom, before the accession of the influence furnished by the male. In the same way you may have in plants a perfect flower, capsules, and well-formed seeds, differing from fruitful seeds only in the circumstance, that they would not grow into a new plant. The metamorphoses of insects have been adduced in support of this notion of evolution: the butterfly, so entirely different from the chrysalis, was entirely contained in the former, and needed only to be disengaged by the removal of the skin, and have its parts unfolded. The rudiments of the tracheæ, which are to contain air in the bee, exist in the fatty substance of the worm from which the perfect insect is formed, and numerous examples of a similar description might be adduced. The phenomenon of incubation, and the successive appearance of various parts until the whole animal is completed, afford a convincing argument for the hypothesis of evolution. After recounting the gradual and progressive unfolding of the body of the chicken, Haller observes, that the progress is nearly the same in quadrupeds. "In the human fœtus, which at first seems a mere unorganized mass, Læwenhoeck already discerned, by means of his microscopes, distinct organization. Thus it is clear, that an animal without any limbs, or discernible arrangement of parts, is gradually changed by various stages into a perfect being, nourished by food, and susceptible of voluntary motion. It may be inquired, whether the animalcule, before it can be recognized by the senses of the dissector, exists in the father or the mother: whether it were formed by epigenesis, or the successive union of particles; or suddenly produced. Epigenesis is altogether impossible. Whoever has contemplated the structure of the body with a little attention, must be convinced that an animal could not exist without a heart, since the principle of life and motion exists in that organ. But the heart must be furnished with arteries to carry the vital fluid to all parts, and with veins to carry it back again.

It is easily proved that the fœtus does not consist of a mere skeleton of blood-vessels. Viscera must accompany these, of which, with some cellular substance, they are entirely composed. But no one has seen the viscera composed by particles successively deposited: they are perfect, although small, as soon as they can be discerned. Muscles must have been present from the first: for the young animal, in the incubated egg, is capable of motion, and from its straight state bends the body. It is moreover irritable, and must consequently have muscles, although they are concealed under the appearance of a mere gelatine. The head is large, and the eyes are visible among the first parts, together with the heart. The muscles require the presence of nerves, the brain must have been present with the head and heart." The hypothesis then, to which these arguments lead, is, that the perfect animal exists previously to conception; that nothing now is generated, but that the parts, which were folded up, and contracted into a small space, are expanded, unfolded, enlarged, and rendered conspicuous. In this mode of explication, we must, it seems, admit, that the germs of all the human race, as well those who have already lived, as those who may hereafter be born, were contained in the ovaria of Eve: a proposition of so strange a nature, and so completely unsusceptible of proof, that we cannot value very highly the hypothesis, which renders it necessary.

The pre-organized germ would remain in a kind of torpid state in its ovarian receptacle, were it not stimulated by the

male semen. This fluid rouses it from its lethargy, and causes its growth and development. The stimulating properties of the semen are supposed by Haller to excite the motion of the heart; and he conceives that the subsequent development of the new being is easily understood.

The great reputation of Haller has not however gained to his opinions on this subject universal assent. The accurate and well-informed Blumenbach of Göttingen has opposed the hypothesis of evolution with great effect, and has arrayed against it a number of objections, which its advocates will not easily elude. His opinions on this subject are, on the whole, the most rational that have been hitherto promulgated: the following statement of them is derived from his manual of natural history, and his institutes of physiology. "The hypothesis of evolution has been employed, particularly in modern times, in order to explain the origin of organized bodies; it has been stated that no man, no other animal, and no plant is generated, but that they have all existed in their parents and ancestors, in the state of complete previously formed germs, since the first creation. The various generations have been continued, one within the other, like a series of pill-boxes, and have been only gradually unfolded and brought to light by fecundation, in their respective turns." Haller, who was the leader of the modern evolutionists, roundly asserted, "that the viscera, and all the bones of the future fœtus, exist before conception in the maternal germ, but nearly in a fluid state, and therefore invisible." This opinion must be deemed, on the first view of it, irreconcilable with reason, on account of the supposition involved in it, of the useless creation of innumerable germs, which are never to be evolved; and it is utterly at variance with all chaste and sound physiological reasoning, on account of the great aid which it requires from preternatural agency, and the useless complication of natural powers which it supposes in opposition to all the laws of philosophical investigation. According to the unanimous representations of the most celebrated and zealous advocates of evolution, the pre-organized germs lie ready in the mother, are roused at the time of fecundation, and proceed to their development by this agency of the male seminal fluid. What we call conception is, therefore, nothing but the excitation of the torpid germ by the affusion of the male liquor. Here then, in the first place, we must suppose an exciting power. But children often resemble most strikingly their father only: bitches, after copulating with different dogs, often have puppies resembling their different fathers: two individuals of different races, as a Negro and an European, produce together offspring of a middle character, or a mulatto: and, where the species of animals or plants is different, mongrels are produced, having as many characters of the father's formation as of the mother's. All these facts cannot be overlooked; and, in order to account for them, the evolutionists suppose in the semen, in addition to its exciting influence, a formative power, by which it can change the pre-organized germ contained in the mother into something of the form of the father. Thus we find two powers in the semen, an exciting, and a formative one. But, by means of an artificial hybrid impregnation, repeated through several generations, we can, at last, change one species of organized bodies entirely into another. One species of plant, fecundated with the male dust of another, produced seeds, from which hybrid fecundable plants were produced. These were again fecundated with dust of the same male plant; and, after this had been repeated four times, a complete metamorphosis had taken place, by which the characters of the male were sub-

## GENERATION.

stituted for those of the female plant. The same circumstances will occur in the human species if the offspring of an European woman by a negro be fecundated by a negro; and the produce of that conception again by a negro, &c. Thus, at last, the preformation of the maternal germ, which has been preserved since the creation of the world, avails nothing, but yields entirely to the formative power of the male fluid, which, according to the hypothesis of evolution, should merely excite it to action. We may affirm, in short, on the whole, that of all the phenomena adduced in support of this hypothesis, not one can be established sufficiently clear to be admitted as a proof; while there are numerous unexceptionable observations directly opposing it.

But, in proportion as this hypothesis of evolution is inconsistent with the phenomena, and with the rules of philosophy, so, on the contrary, the opinion, not that any fictitious germs are evolved by means of conception, but that the new being is in fact generated, and gradually and successively formed from the generative fluids, commends itself to our approbation by its simplicity, and its accordance with the other processes of nature.

Since this affair of a true generation by successive formation has been variously explained by physiologists, I conceive that we shall approach most nearly to the truth, by adopting the following propositions. 1st. The materials, of which organized bodies, and consequently the human frame is composed, differ from all other matter in being regulated simply and exclusively by vital powers. 2d. Of these the most remarkable, and that, whose existence and agency can be the least questioned, is the force which acts on organized matter, when prepared for its destination, but not yet moulded into shape, and bestows on it, according to its various natures, various but determined and definite forms. In order to distinguish this vital power properly from all others, I give it the name of *nifus formativus*. 3d. This *nifus formativus* is imparted to the materials of generation, when they are contained in a mature state, under the requisite conditions, in the uterine cavity, builds up in it the rudiments of the embryo, and gradually forms its organs to correspond to their pre-ordained purposes: it preserves the same structure by the process of nutrition, as long as life continues; and it obviates the effects of casual mutilation, as far as that can be accomplished, by means of reproduction.

This gradual formation of new organized bodies can be most manifestly discerned in those, which combine, with a considerable magnitude, a rapid growth, and such a kind of delicate semi-transparent texture, that they can be clearly seen through, particularly in a sufficient light, and with moderate magnifying powers. This is the case in the vegetable kingdom, with some simple aquatic productions, as the *conversa fontinalis*, which is propagated in the early part of spring; in the bloodless divisions of the animal kingdom, with the polypes (*hydra*); in the animal kingdom, with the incubated egg, on the first appearance of the chicken, and its subsequent daily development.

It must be observed here, that the expression *nifus formativus* is employed simply for the purpose of distinguishing this from the other kinds of vital powers, and by no means with any intention of explaining the cause of generation. I believe the latter to be concealed by no less impenetrable darkness than that which involves the causes of gravitation and attraction, which are only names for effects, recognized like the *nifus formativus*, a posteriori. I have employed the word *nifus* chiefly in order to denote that the nature of this force is truly vital, and to distinguish it as clearly as possible from the merely mechanical powers, by means of which

some philosophers formerly endeavoured to explain the business of generation. The very point on which the whole of this doctrine concerning the *nifus formativus* hinges, and which alone sufficiently distinguishes it from the *vis plastica* of the ancients, the *vis essentialis* of Wolf, and other hypotheses of the like nature, consists in the combination of the two principles, by which the nature of organized bodies is explained, *viz.* the physico-mechanical and the teleological.

I hold it most probable, that in the first place, a definite time is required for the various fluids of each sex, which seem to be united in the cavity of the uterus after a fruitful copulation, to be more intimately mingled, and brought to maturity. When the period of this preparation is completed, the mature and intimately blended fluids become animated by the *nifus formativus*, by which the hitherto unformed materials of generation are partly moulded into the elegant coverings of the ovum, partly into the figure of the contained embryo. Hence we can understand, why the smallest vestige of a formed *fœtus* cannot be discerned, even with the assistance of the excellent modern dioptrical instruments, during the first week after conception, excepting the unformed fluids contained in the uterine cavity; while the embryo appears as it were on a sudden in the third week.

I should exceed the limits of these institutions, if I were to recount at greater length those arguments drawn from nature herself, by which the influence of the *nifus formativus* in generation seems to me to be rendered very highly probable. I shall advert very shortly to a few of these points, the force of which will be easily discovered by a more attentive consideration. On this principle I explain the memorable experiment in the history of hybrid productions, where prolific hybrids, fecundated during several generations, by the male seed of the same species, have produced an offspring gradually deviating from the original maternal form, and assuming the characters of the father, until at last the former has been completely changed into the latter by a kind of arbitrary metamorphosis.

The well-known fact of the great frequency of monstrous productions in some species of domesticated animals, particularly swine, and their rarity in the wild condition of the same animals, can only be explained on the principles already stated. The evolutionists are compelled to assert that all these monstrosities must have existed in the germs from the first creation of things. The phenomena of reproduction, taken altogether, can be much more aptly explained by the agency of the *nifus formativus*, than on the notion of pre-existent germs; and some particular examples, as, for instance, of nails growing on the middle, after the loss of the first phalanx, cannot well be solved on any other principle.

After considering, and carefully weighing the arguments on both sides of the question, it appears, that even those who assume pre-existent germs, must allow to the male seminal fluid a considerable formative influence, in addition to the exciting power, which they recognize in it, and consequently that the doctrine which they defend requires, in fact, the assistance of the *nifus formativus*; while the latter sufficiently explains the phenomena of generation, without the aid of pre-existing germs." Whatever theory of generation we adopt, we must ultimately ascend to the agency of the Creator, the primary cause of all existence.

The circumstances belonging to the state of pregnancy; the period and phenomena of parturition and its consequences, are treated under those articles of the *Cyclopædia* which relate to the subject of midwifery.



*GENERATION of Birds, Fishes, Fossils, Insects, Metals, Mineral, Mushrooms.* See BIRD, FISH, FOSSILS, INSECTS, &c.

*GENERATION of Plants.* See FECUNDATION and GEMMA.

*GENERATION of Shells.* See SHELLS.

*GENERATION of Stones.* See STONES, SPAR, TROCHITES, and CRYSTALS.

*GENERATION, in Theology.* The father is said, by some divines, to have produced his Word, or Son, from all eternity, by way of generation; on which occasion the word generation raised a peculiar idea: that procession which is really effected in the way of understanding, is called generation, because in virtue thereof the Word becomes like to him from whom he takes his original; or, as St. Paul expresses it, is the figure or image of his substance, *i. e.* of his being and nature. See TRINITY and PERSON.—And hence it is, they say, that the second person in the Trinity is called the Son.

*GENERATION* is also used, though somewhat improperly, for genealogy, or the series of children issued from the same stock. Thus the gospel of St. Matthew commences with “the book of the generation of Jesus Christ, &c.” The latter and more accurate translators, instead of generation, use the word *genealogy*.

*GENERATION* is also used to signify a people, race, or nation, especially in the literal translations of the scripture, where the word generally occurs wherever the Latin has *generatio*, and the Greek γενεα, γενεαις.

Thus, “A wicked and perverse generation seeketh a sign,” &c. “One generation passeth away, and another cometh,” &c.

*GENERATION* is also used in the sense of an age, or the ordinary period of a man's life.

Thus we say to the third and fourth generation. In this sense, historians usually reckon a generation the space of thirty-three years, or thereabouts. See AGE.

Herodotus makes three generations in an hundred years; which computation appears, from the latter authors of political arithmetic, to be pretty just. See CHRONOLOGY and POLITICAL arithmetic.

*GENERATOR, in Music,* signifies the principal found or sounds by which others are produced. (See GENERATE.) Thus, the lowest C for the treble of the harpsichord, besides its octave, will strike an attentive ear with its twelfth above or G in alt, and with its seventeenth above, or E in alt. The C, therefore, is called their “generator,” and the G and E its products or harmonies. But in the approximation of chords for G its octave below is substituted, which constitutes a fifth from the generator, or lowest C; and for E is likewise substituted its fifteenth below, which, with the above-mentioned C, forms a third major. To the lowest notes, therefore, exchanged for those in alt, by substitution, the denominations of products or harmonies are likewise given, whilst the C retains the name of their “generator.” But still, according to the system of Tartini, two notes in concord, which, when sounded, produce a third, may be termed the “concurring generators” of that third.

*GENERIC NAME, in Natural History,* the word used to signify all the species of natural bodies, which agree in certain essential and peculiar characters, and therefore all of the same family or kind; so that the word used as the generic name equally expresses every one of them, and some other words expressive of the peculiar qualities or figures of each are added, in order to denote them singly, and make up what is called a specific name.

Thus the word *rosa*, or *rose*, is the generic name of the

whole series of flowers of that kind, which are distinguished by the specific names of the red rose, the white rose, the apple rose, &c. The ignorance of former ages, in the true principles of natural history, has occasioned the bodies, which are the objects of it, to be arranged into very unnatural series under the name of genera; and these have been called by names as improper as the characters they were distinguished by. Linnaeus has done a great deal in exploding the bad generic names in botany, and Artedi has applied his rules about the formation of these names with very little difference to the subjects of ichthyology.

Many of the generic names of fish, till the time of this author, were so barbarous and obscure, that it was not easy to trace them to their original, or to find whether they were truly Teutonic, English, Dutch, Swedish, French, Italian, Spanish, Portuguese, Latin, or Indian.—The ignorance of the writers on these subjects, or their too scrupulous adherence to the customs of their predecessors, seem to have been principally the causes of this, and often an entire negligence. Artedi's rules for generic names for fish are these: whatever fish there are which agree in the same generic characters, and are properly of the same genus, these ought all to be called by the same generic name, their differences being only expressed by specific ones. This appears so plain, so just, and so necessary a rule, that it is almost a shame to lay it down; yet the writers on fish, till the time of this author, had very seldom observed it.

Another barbarism and impropriety in the generic names of fish among the old authors, is the using of the same words to express them, which are also the names of other animals, quadrupeds, birds, and reptiles. These are subject to great objection; because when they are used, it is not easy to see, in some cases, whether the author is speaking of a bird, a beast, or a fish. It is therefore one of the general rules of Artedi, that all these names are to be abolished, as also all those which are common to fish, and to plants, minerals, and to the tools of husbandry, or other services.

Another rule of this excellent author is, that generic names that are composed of two whole words, unnaturally tied together, are to be abolished, it being easy to contrive names less barbarous, and as expressive: next to these are to be exploded those names which are formed of two generic words before in use, the one broken or cut short, the other preserved entire.

Another general rule in regard to these names is, that all such as are not of either Latin or Greek origin, are to be proscribed and wholly rejected. This rule cuts off a prodigious number of barbarous words, with which we find the books of authors of former ages on these subjects crowded.

A sixth rule for the regulating generic names is, that all such are to be abolished as terminate in *oides*, as expressing a resemblance often imaginary, and often alluding to something unknown, or rendered difficult to trace from the changes which the names of other things have undergone since the time when it was formed. These words convey no idea of the character of the genus expressed by them, except that they are like the other thing alluded to in some external, though perhaps not essential, character: of this kind are the *rhomboides*, *scorpoïdes*, &c.

A seventh rule in regard to these names is, that all such are to be rejected as are barely diminutives, and terminate in *ulus* or *ula*. These convey no other idea, but that of the fish being like some other fish, only less: now bigness is no generic character; therefore if this genus, and that re-

ferred to, differ only in size, they have no general difference at all; if they do differ otherwise, they should be expressed. What makes many of these names also more intolerable is, that they allude not to fish, but to other things so different in their nature, that there must needs be many other more essential varieties between them, beside size.

Another general rule is, that such general names as are pure Latin, but are mere adjectives, are to be exploded, there being no reason for using them as substantives.

A ninth general rule is, that such names as are formed of Latin words, unknown to the ancient Romans, and formed by the later writers, are to be expelled as barbarous, and others of better credit placed in their stead.

Finally, such general names as have been given to fish from the places where they are caught are to be rejected; of this kind are the *ardella* and *ardina* from the island of Sardinia, and the *sturio* from Afluria, a province of Spain. These sorts of names can convey no idea of the nature of the fish, and may belong as well to one genus as to another. Artedi, *Ichthyolog.* p. 10. 69. 73. 79.

These rules of proscription banished so many of the received general names of fish, that it might be supposed the whole number was exhausted, and all the fish in the world to be named anew. But this is not the case; the genera are in reality much fewer in number than they have been usually supposed, and therefore fewer words will serve to express them, and there yet remain many truly Latin words used by the ancient Romans, by which the far greater part of the genera may be expressed, and the few remaining may be best denominated by compound Greek words, expressive of their real characters.

Among the true and genuine Latin, and Græco-Latin names of the genera of fish, are these: *accipenser*, *amia*, *anthias*, *halæna*, *blennius*, *clupea*, *cobites*, *cyprinus*, *delphinus*, *elops*, *efox*, *exocætus*, *gobius*, *labrus*, *lamia*, *liparis*, *mugil*, *mullus*, *muræna*, *perca*, *physeter*, *pristis*, *raja*, *salmo*, *salpa*, *scarus*, *seomber*, *sibirus*, *sparus*, *squalus*, *thynnus*, *torpedo*, *triton*, *tursio*, *uranoscopus*, *xiphias*, *zeus*. These will go a great way toward the naming of the true genera. Artedi has merited greatly of the world, in thus reforming the names of fish; and the rules he has laid down, thus given at large, may, with little variation, be made to serve for any other author, in whatever branch of knowledge he has occasion to write.

GENERIS SECUNDI. See SECUNDI.

GENEROSA, a *Gentlewoman*. See GENTLEWOMAN and SPINSTER.

GENEROSITY, *Order of*, an order of knighthood, established in 1685, by Frederick III., elector of Brandenburg and king of Prussia, whilst he was electoral prince. The badge was a gold cross of eight points enamelled azure, bearing in the centre this inscription "LA GÉNÉROSITÉ," and pendent to a blue ribband.

GENESAN, in *Geography*, a town in the Arabian Irak; 90 miles S. of Bagdad.

GENESAR, or GENESARETH, called also *Civareth*, and afterwards *Iberias*, a town of Palestine on the lake of the same name, called also *Sea of Galilee*, which see.

GENESE, a township of America, in the state of New York, and county of Ontario, having 217 electors.

GENESÉE *Country*, a large tract of land in the state of New York, deriving its name from Genessee, one of its rivers, and bounded N. and N.W. by lake Ontario, S. by Pennsylvania, E. by the western part of the military townships in Onondago county, and W. by lake Erie and Niagara river. This is a rich tract of country, and well watered by lakes

and rivers, it is flattish, its rivers are sluggish, the soil is moist, and its lakes are numerous.

GENESE, or *Genessee River*, rises in Pennsylvania, near the most elevated spot of this state, where also the easternmost water of Alleghany river, and Pine creek, a water of Susquehanna, and Tioga river rise. It has several falls, which furnish excellent mill-seats, that are improved by the inhabitants. After a course of about 100 miles, chiefly N.E. by N., it discharges itself into lake Ontario, 4½ miles E. of Irondequat, or Rundagut bay, and 80 miles E. from the falls of Niagara. The settlements on this river, from its mouth upwards, are Northfield, Northampton, Hartford, Genessee, and Williamsburgh. When the western canals and locks are completed, there will not be any carrying place between the city of New York and Williamsburgh. The Genessee flats lie on the borders of this river, about 20 miles in length and about four in breadth. These are mostly the property of the Indians.

GENESE, or *Genessee County*, is bounded N. by lake Ontario, W. by Niagara river and Lake Erie, S. by Pennsylvania, and E. by the counties of Tioga and Orondago. It comprehends the counties of Ontario, Steuben, and Genessee, and contained, in the year 1800, upwards of 17,000 persons. This county is finely watered by the Genessee river and its tributary streams, several creeks, and also lakes, which are from 20 to 40 miles in length. The southern part is watered by several branches of the Susquehanna. This county is large, and comprehends the western part of the state of New York.

GENESIS, in *Biblical History*, the first book of the Old Testament, containing the history of the creation, and the lives of the first patriarchs.

The book of Genesis stands at the head of the *Pentateuch*, which see. Its author is held to be Moses: it contains the relation of 2369 years, *viz.* from the beginning of the world to the death of Joseph. The Jews are forbid to read the beginning of Genesis, and the beginning of Ezekiel, before thirty years of age.

The Hebrews called this book *Berefsibith*, because it begins with that word, which in their language signifies *in principio*, or *in the beginning*. The Greeks gave it the name Genesis, *Γένεσις*, *q. d.* production, generation, because it begins with the history of the production or generation of all beings.

This book, besides the history of the creation, contains an account of the original innocence and fall of man; the propagation of mankind; the rise of religion; the general defection and corruption of the world; the deluge; the restoration of the world; the division and peopling of the earth; and the history of the first patriarchs to the death of Joseph. It was easy for Moses to be satisfied of the truth of what he delivers in this book, because it came down to him through a few hands: for from Adam to Noah, there was one man, *viz.* Methuselah, who lived so long as to see them both: in like manner Shem conversed with Noah and Abraham; Isaac with Abraham and Joseph, from whom the records of this book might easily be conveyed to Moses by Amram, who was contemporary with Joseph.—Patrick.

GENESIS, in *Geometry*, denotes the formation of a line, plane, or solid, by the motion or flux of a point, line, or surface. See each respectively; also FLUXION and CURVE, and GENERATION.

The genesis, or formation, *e. gr.* of a globe or sphere, is conceived by supposing a semi-circle to revolve upon a fixed line, drawn from one extreme thereof to the other, called its axis, or axis of circumvolution: the motion or revolution

of that semi-circle is the genesis of the sphere, &c. See **GLOBE** and **SPHERE**.

In the genesis of figures, &c. the line or surface that moves, is called the describer; and the line round which, or according to which, the revolution or motion is made, the dirigent.

**GENEST, CHARLES-CLAUDE**, in *Biography*, was born at Paris in 1639. Being of an unsettled disposition, he resolved to go to the Indies to seek his fortune, but the vessel in which he sailed having been captured by the English, he was brought to London, where he subsisted for some time by teaching the French language. On his return to his own country, he obtained the post of preceptor to Mademoiselle de Blois, afterwards duchess of Orleans, and other considerable offices among the great. He became a member of the French academy in 1698, and died at Paris in 1719. Though a courtier, he was sincere and simple in his manners, and estimable in his character. He derived a taste for natural philosophy from the lectures of Rohault, the disciple of Descartes, and for metaphysics from the instructions and conversation of Bossuet. He was an elegant scholar, and greatly devoted to poetry and polite literature. His works are numerous, of which the principal are "Principes de Philosophie," in which the author adduces many arguments in defence of a God, and of the immortality of the soul. "Occasional Pieces of Poetry." Several tragedies, and "A dissertation upon Pastorals." Moreri.

**GENEST-DAMBIERRE, ST.** in *Geography*, a town of France, in the department of the Vienne; seven miles W. of Châtellerault.

**GENEST-MALLISAUT, ST.** a town of France, in the department of the Loire, and chief place of a canton in the district of St. Etienne; four miles S. of St. Etienne. The place contains 1987, and the canton 5648 inhabitants, on a territory of 150 kilometres, in five communes.

**GENET, FRANCIS**, in *Biography*, was born at Avignon in the year 1640; here he received his grammatical learning, and having acquired a considerable knowledge in the Latin and Greek, he entered upon philosophy, and was for a time a disciple of Scotus, but he afterwards relinquished his system, and became zealously attached to the philosophy and theology of Aquinas. In 1670, he was admitted to the degree of doctor in civil and canon law at Avignon, and acquired much reputation by the theses, which he delivered on that occasion, against simony. His talents recommended him to the notice of the archbishop of Aix, who for some time made use of him in the management of the ecclesiastical concerns of his metropolitan district. He was afterwards employed and patronized by M. Le Camus, bishop of Grenoble, who engaged him in the composition of a system of moral theology, which was afterwards published in six volumes 12mo. under the title of "Morale de Grenoble." This work was well received, has gone through many editions, and has been translated into the Latin language. Soon after its publication, the pope, Innocent XI. created M. Genet canon and prebend of the cathedral church at Avignon, and in 1685 appointed him bishop of Vaifon. He discharged all the duties of his episcopal functions with exemplary watchfulness and zeal, till the year 1688, when he was prosecuted for having admitted into his diocese the religious belonging to a new convent at Touloufe, which Louis XIV. had suppressed. By the arbitrary mandate of the king, the good bishop was arrested, and imprisoned for fifteen months in the Isle of Rhe, whence he was released by the interposition of the pope. He was accidentally drowned in 1702. Moreri.

**GENET, or Jennet**, said to be derived from *wynn*, bene

natus, in the *Manege*, &c. a small-sized, well-proportioned Spanish horse.

Some also give the name *geneta* to well-made Italian horses.

**GENET, Order of**, an order of knighthood, instituted in France by Charles Martel in the year 726, for commemorating a signal victory, which he obtained in that year over the Arabian army, commanded by Abdiramo. The badge of the order was a genet fiant, enamelled azure, spotted or freckled gules, and collared or, on a mount vert, enamelled with flowers proper. This badge was worn pendent to a collar composed of three chains of gold interlaced with red enamelled roses. This order was instituted for sixteen knights, and continued in great repute till the reign of king Robert, when it was abolished on his devising the order of the star, in honour of the holy virgin.

**GENETHLIA**, Γενεθλια, in *Antiquity*, a solemnity kept in memory of some person deceased.

**GENETHLIACI**, formed of the Greek γενεθλια, origin, generation, nativity, in *Astrology*, persons who erect horoscopes, or pretend to foretell what shall befall a man, by means of the stars which presided at his nativity.

The ancients called them *Chaldaei*, and by the general name *mathematici*: accordingly, the several civil and canon laws, which we find made against the mathematicians, only respect the genethliaci, or astrologers.

They were expelled Rome by a formal decree of the senate; and yet found so much protection from the credulity of the people, that they remained therein unmolested. Hence an ancient author speaks of them as "hominum genus, quod in civitate nostra semper & vetabitur, & retinebitur."

Antipater and Archinopolus have shewn, that genethliology should rather be founded on the time of the conception than on that of the birth. Vitruvius.

**GENETHLIACUM, GENETHLIAC Poem**, is a composition in verse, on the birth of some prince, or other illustrious person; wherein the poet promises him great honours, advantages, successes, victories, &c. by a kind of prophecy or prediction: such is the eclogue of Virgil to Pollio, beginning,

"Sicelides Muses, paulo majora canamus."

There are also genethliac speeches or orations, made to celebrate a person's birth-day.

**GENETIDES**, in *Natural History*, a name given by the ancients to the stone more generally known under the name enchymentites. This was the spar incruited on the tops and sides of subterranean caverns, which they supposed daily to bring forth more, and therefore gave the powder of it to women at the time of their lying-in, to promote their speedy delivery.

**GENETTA, To ride à la**, is to ride in the Spanish fashion, *i. e.* with the stirrups so short, that the spurs beat upon the flanks of the horse. This is deemed a piece of gallantry in Spain, but not among us.

**GENETTA**, in *Zoology*, a species of *Viverra*, which see.

**GENETTE**, in the *Manege*, a Turkish bit, the curb of which is all of one piece, and made like a large ring, and placed above the liberty of the tongue. When they bridle a horse, they make his chin pass through this curb, which surrounds his beard. This sort of bit was much used at the court of France when Guillet wrote.

**GENETYLLIS**, Γενεθλια, in *Antiquity*, a solemnity celebrated by women, in honour of Genetyllis, the goddess of that sex.

**GENEVA, or GIN**, a popular name for a compound water,

water, which is, or ought to be, procured from the berries of the juniper-tree, distilled with brandy or malt-spirits. See JUNIPER-BERRIES.

The word is formed from *genevre*, the French name of the juniper-berry.

The best geneva we now have, is made from an ordinary spirit, distilled a second time with an addition of some juniper-berries; but the original liquor of this kind was prepared in a very different manner. It was a custom in the distilling of spirits from wort, or other fermented liquors, to add in the working some aromatic ingredient, such as ginger, cortex Winteranus, or grains of paradise, to take off the bad flavour, and to give a pungent taste to the spirit. Among other things used with this intent, some tried the juniper-berries, and finding that they gave not only an agreeable flavour, but very valuable virtues also to the spirit, they brought it to a general custom, and the liquor sold under this name. The method of adding the berries was to the malt in the grinding: a proper proportion was allowed, and the whole was reduced to meal together, and worked in the common way. The spirit thus obtained was flavoured *à l'origine* with the berries, and exceeded all that could be made by any other method. Our common distillers leave out the juniper-berries entirely from the liquor they now make and sell under that name. Our chemists have let them into the secret, that the oil of juniper-berries, and that of turpentine, are very much alike in flavour, though not in price: and the common method of making what is called geneva in London, is with common malt spirit, and a proper quantity of oil of turpentine distilled together. Shaw's Essay on Distill. p. 7. See DISTILLER.

GENEVA, in *Geography*, a city of France (since the revolution), principal place of a district, and capital of the department *Leman*, but formerly capital of a republic, in alliance with the Swifs; situated on the confines of Savoy, France, and Switzerland, at the southern extremity of the "lake of Geneva," or "Leman lake," upon the narrowest part of it; where the Rhone issues in two large and rapid streams, which soon afterwards unite, and, passing through the city, divides it into two unequal parts. The adjacent country is uncommonly picturesque, and abounds in magnificent views, formed by the town, the lake, the numerous hills and mountains, particularly the Saleve and the Mole, rising suddenly from the plain in a variety of fantastic forms, backed by the glaciers of Savoy, with their frozen tops glistening in the sun, and the majestic Mont Blanc rearing its head far above the rest. Geneva, which stands partly in the plain, upon the borders of the lake, and partly upon a gentle ascent, is irregularly built: the houses are high, and many in the trading part of the city have arcades of wood, which are raised even to the upper stories. These arcades, supported by pillars, give a gloomy appearance to the street, but are useful to the inhabitants in protecting them from the sun and rain. This is the most populous town in Switzerland; and the inhabitants are estimated to be from 23,000 to 25,000. This population is owing to the industry and activity that prevail in this place, to its extensive commerce, to the facility of purchasing the burghership, and to the privileges which the government allows to all foreigners. The members of this city are distinguished into citizens and burghers, inhabitants and natives, besides a fifth class, established after the revolution in 1782, and called "domiciliés," who receive from the magistrates an annual permission to reside in the city. The citizens and burghers were, under the old police, admitted to a share in the government; the inhabitants are strangers allowed to settle in the town with certain privileges, and the natives are the sons of these inha-

bitants, who possess additional advantages: these two last classes form a large majority of the people.

The liberal policy of this government, in receiving strangers, and conferring the burghership, is the more remarkable, as it is contrary to the spirit and usage of the Swifs. Here it is peculiarly necessary; as the territory of this state is so very small, that its very existence depends upon the number and industry of the people; for, exclusively of the city, there are scarcely 16,000 persons in the whole district of the Genevois.

Geneva boasts, and not without reason, of its antiquity. The precise time of its commencement is not known; but it existed before the Christian era, and is particularly mentioned by Cæsar. (*De Bell. Gall. l. i. c. 1.*) It belonged to the Allobroges (see this article), and flourished under the successors of Cæsar. The Christian religion was introduced among the Genevans in the third century, and about the middle of the 4th century Geneva appears to have been the see of a bishop. It suffered, however, in a considerable degree, and in common with other parts of the western empire, from the incursions and ravages of the northern barbarians. About the middle of the fifth century the Vandals, who, having settled in the country of Vaud, and built several boroughs, assumed the name of Bourguignons, or, according to modern orthography, Burgundians, had possession of it; and in the year 620, it was transferred to the Franks. Towards the end of the 8th century, Charlemagne convened an assembly of his states at Geneva, to consult about a war with the Lombards, and confirmed both the civil and religious privileges of this city. In the year 1032, it was annexed to the German empire; but the authority of the emperor was little regarded in distant provinces, and they found it expedient to protect associations of the common people, and to enlarge their liberty, in order to counteract the tyranny of the lords and clergy. In process of time, the clergy acquired a great degree of secular power and jurisdiction in connection with their spiritual authority: and thus the bishops of Geneva had obtained of the emperor the title of princes and sovereigns over the town and the adjacent country. On the other hand, the counts of the Genevois, or of the district in the vicinity of Geneva, who were originally officers of the empire, though afterwards they became vassals of the bishops, aspired to an exclusive administration of justice both in the town and the country. The people availed themselves of the contest between their superiors in rank and power to confirm and extend their own privileges. In the mean time, the liberty of the city was menaced by a third power, no less formidable than either of the other two. The counts of Savoy became powerful by the successive possession of several provinces; and among the rest the Genevois favoured the pretensions of the ancient counts, and aspired to the sovereignty of a flourishing town, which was also a convenient and strong frontier.

It would not be very interesting to recite, in minute detail the contests that were from time to time renewed between the Genevois and the counts of Savoy. We shall content ourselves with observing that in the year 1415, the emperor Sigismund visited Geneva, and that two years afterwards he created Savoy into a dukedom in favour of Amadeus, the 8th count, who, in the year 1420, petitioned the pope for the sovereignty of the city. The duke's suit was referred by the pope to the bishop, who summoned a general assembly of the people, to deliberate upon the duke's request, which had obtained the approbation of the pope. The inhabitants unanimously rejected it, and at the same time required the bishop to be true to his charge, assuring him of their con-

currence in maintaining his just rights, and those of the city. This noble spirit encouraged the bishop, and produced a most excellent act in favour of liberty; for he entered into a formal agreement with the people and the syndics, never to alter the constitution without their consent. This act, having been engrossed in Latin, and the observance of it sworn to by the bishop, the syndics, and the council, was subscribed by all the magistrates, commonalty, and clergy of Geneva; and in the following year was confirmed by the emperor Sigismund, who declared Geneva to be an imperial city, under the title of "Nobile Imperii Membrani," and took it into his immediate protection against all powers, the duke of Savoy in particular. The Genevese, however, maintained their liberties against the repeated attacks made upon them by the dukes of Savoy under very great disadvantages. Nevertheless, they persevered till about the beginning of the 16th century, when an alliance was entered into between Geneva and Friburg, the contest continued, and was the occasion of many acts of oppression and persecution. When the treaty was concluded, in consequence of the active interference of a young citizen of Geneva, named Berthelier, two parties arose in Geneva, one of which retained an attachment to the interest of the duke of Savoy, and the other declared itself on the side of liberty. Those of the latter description were called "Eignots," which in Swiss, or High German, signifies "confederates by oath," and from which the term "Hugonots" is probably derived; whilst those of the former were denominated "Mamalukes," in reference to the Egyptian soldiery, who being originally Christians, renounced both their religion and liberty, to become slaves to the sultan. The duke, irritated by this conduct, entered Geneva with an armed force, and compelled the people to renounce their new alliance, whilst he persuaded Friburg to withdraw from the treaty, promising not to injure the liberties of the Genevese. Berthelier, the Genevan patriot, was however sacrificed to his vengeance, and the magistrates of the city were deposed by the bishop. In the year 1526, a new alliance was formed between the towns of Bern, Friburg, and Geneva, which the duke of Savoy was not able to prevent, and occasioned wars of long continuance between the republic and Savoy. This alliance was confirmed by the bishop; and may be considered as the true era of the independence of Geneva. Soon after this period, viz. in 1533, the doctrines of the reformation were preached at Geneva by William Farel, a native of Gap in Dauphiné, and Peter Viret, of Orbe; and the people, animated by the enthusiasm of liberty, determined to emancipate themselves from the yoke of bondage, both ecclesiastical and civil. The bishop, who had always acted a weak and deceitful part, became despicable both to the Genevese and to the duke; and by his imprudent menaces and precipitate retreat, served to strengthen the cause of the reformation. In 1535, the doctrines of the reformation were adopted in full council; and in consequence of this decision, the canton of Friburg renounced the alliance. In the following year, the famous John Calvin, driven from France by persecution, arrived at Geneva, and completed the reformation, that had been already begun by Farel and others. So great was the ascendancy which Calvin, though a foreigner, acquired over the citizens, that he possessed considerable influence even in civil matters; and was eminently instrumental in settling the political constitution. To this end, as well as to encourage theological erudition, he prevailed upon government to establish a public academy, the presidentship of which he obtained for his friend and fellow labourer, Theodore Beza. In this new seminary, Calvin, Beza, and others, eminent for their superior knowledge, read lectures with such uncommon reputation and success, as attracted students from all

quarters. It had also a public library, which owed its origin about this period to the liberality of Bonnivard, prior of St. Victor, who was twice imprisoned for having asserted, against the dukes of Savoy, the independence of Geneva. He was a principal promoter of the reformation by gentle means and gradual instruction. He closed his benefactions to his beloved city, by the gift of his valuable manuscripts and books, and by bequeathing his fortune towards the establishment and support of the seminary. Geneva was now regarded as the asylum of the reformed religion: and by the accession of persecuted protestants from other cities and countries, its arts and commerce flourished, and its population increased.

In 1584, Geneva concluded a treaty of perpetual alliance with Zurich and Bern, by which it formed a part of the Helvetic confederacy. The last attempt of the house of Savoy against Geneva took place in 1602, when Charles Emanuel attacked the town during a profound peace. The inhabitants, however, nobly defended themselves, repulsed the enemy, and obliged him to abandon his treacherous design. This perfidious attack was followed by a war, which was terminated in the following year by a solemn treaty. Since that period, uninterrupted peace has been maintained between Geneva and the duke of Savoy; although the king of Sardinia did not, till the year 1754, formally acknowledge the independence of the republic. From that period, the history of Geneva contains little more than a narrative of contentions between the aristocratical and popular parties. The constitution of Geneva, which had then been established, and which continued for several years, under a certain modification and improvement of the year 1768, was a kind of mean between those of the aristocratical and popular cantons; more democratical than any of the former, as the sovereign and legislative authority were veiled in the general assembly of the citizens; but more aristocratical than the other, because the powers entrusted with the great and little councils were very considerable. The salaries of the magistrates were so inconsiderable, as not to offer any temptation of pecuniary emolument; and the revenues of government, at the highest calculation, generally amounted to 30,000 pounds a year. Their constitution, indeed, was defective, as they had no precise code of penal law; but that of civil law was the most perfect part of their government. In Geneva, as well as in all the other principal towns of Switzerland, a public granary was established, and they had always in reserve a sufficient quantity of corn to supply the inhabitants during a year and a half. Geneva was the only republic in Switzerland which had no regular companies of soldiers in any foreign service. Geneva was always more or less distracted by internal dissensions and tumults. In 1782, these had prevailed to such a degree, that the kings of France and Sardinia, together with the canton of Bern, interfered, and threatened to besiege the city. The peasants of the territory joined the Genevese, and offered to serve in their cause without pay, to mount guard, and work at the fortifications. M. de Jaucourt, the commander of the French troops, threatened, in case of resistance, to enter the town by force, and insisted that no person should appear in the streets, that all arms should be delivered up, and that the chief of the "representants," as the popular party was called, should retire from Geneva, and that the deposed magistrates should be reinstated. Resistance in these circumstances must have been altogether unavailing, and must, indeed, have terminated in the destruction of the city. The representants, therefore, restored the confined magistrates to liberty, and left the city in a body. The Sardinians, who first entered the gates, found the city almost deserted; and soon after the two other

commander-

commanders made their entry at the head of their respective troops, with drums beating and colours flying. The aristocratical party celebrated their triumph with balls, feasts and every species of public diversion. A committee, appointed by the great and little councils, prepared, in concert with the three generals, an edict for new modelling the constitution, which, being approved at the courts of Versailles and Turin, and by the canton of Bern, was confirmed by the great and little councils. Much as the Genevans seemed to deplore the consequences of this revolution, the change that was made in their constitution, and the diminution of that liberty to which they had been accustomed, and to which they ascribed the increase of their population and riches, the ferment soon subsided: and excepting the principal leaders, those of the popular party who were banished, and some few others who renounced their country under the influence of their political principles, the greater number of the emigrants returned, and again settled in the place of their nativity. According to Mr. Coxe, this revolution caused scarcely 600 persons to leave Geneva. The emigrants principally established themselves at Brussels and Constance; where they introduced manufactures of linen and of watches. A plan was also formed for giving an asylum to the Genevan emigrants in Ireland (See *New Geneva*.) The form of government established in 1782 underwent another very considerable change in consequence of the revolution in 1789. The aristocratical party was obliged to yield, on this occasion, to the tumultuous demands of the people; and when the solicitor-general, in the name of the citizens and burghers, requested the recovery of their ancient liberties, the permission of bearing arms, the re-establishment of the militia, and of their circles or political clubs, the removal of the garrison from the barracks, and the recal of the representatives banished in 1782; such moderate demands were received with satisfaction; and the new edict of pacification, under the title of "Modifications à l'Edit de 1782," was approved by the Senate, Great Council, and General Council. In this latter council, the "Modifications" were carried by 1321 suffrages against 52. The publication of the new edict was followed by loud acclamations and general rejoicings. This new constitution was judiciously modelled into a mean between the too popular form established in 1768, and the too aristocratical form established in 1782. It is natural to imagine that the widely extended influence of the French revolution would very soon reach the Genevan republic. Many, seduced by the principles of infidelity actively disseminated by Voltaire, and fascinated by the system of general equality laid down in the "Social Contract" of Rousseau, whom they proudly styled the philosopher of Geneva, became the apostles of irreligion and democracy. Accordingly, a large party was pre-disposed to admit the French doctrines; and in the beginning of 1791, a club, called the "Circle of Light," gave energy and direction to the advocates of general equality. Their efforts were opposed by all the friends of the constitution, and two parties were again formed, which threatened the renewal of past commotions. Intimidated, emissaries from France excited an insurrection among the peasants of the Genevois, and a large body of them marched towards Geneva, to demand the extension of the burghership. Although this first hostile attempt proved unsuccessful, the government, apprehensive of another insurrection, and anxious to remove every cause of complaint, granted additional privileges to the natives, and particularly general admission to the burghership for the small sum of six guineas. (March 1791.) Soon after the abolition of monarchy, the Brissotine party, in conformity with their plan of surrounding France with a

chain of petty republics, proposed to separate Geneva from the Helvetic confederacy, and either form it into a small dependent commonwealth, or incorporate it with the French republic. Although this attempt failed, the independence of Geneva was at length annihilated, and it was incorporated, together with its territory, with the French republic in 1798; and now forms part of the department of *Leman*, (which see.) Geneva, according to this new division, comprehends three cantons, 22 communes, on a territory of 125 kilometres. N. lat. 46° 12' 17". E. long. 6° 8' 30". Mod. Un. Hist. vol. xxxii. Coxe's Travels in Switzerland, vol. ii.

GENEVA, a post-town of America, in the county of Ontario, and state of New York, in the great road from Albany to Niagara, situated on the bank of the N.W. corner of Seneca lake, about 74 miles W. of Oneida castle, and 92 W. of Whitefrown. It has nearly 100 houses. N. lat. 42° 52'. W. long. 74° 6'.

GENEVA, *Lake of*, or *Lake of Lemman*, a large lake of Switzerland, which stretches from Geneva to Villeneuve, being in length 54 miles, in the shape of a crescent; the hollow is formed by Switzerland, and the convex part by Savoy; the greatest breadth, from St. Sulpice to Grande Rive, is 12 miles. Savoy affords a rude and awful boundary of aspiring Alps, craggy and covered with ice of long standing. From Geneva to the environs of Laufanne the country slopes for a considerable distance to the margin of the lake, and is enriched with all the varieties which nature can bellow: the long ridge of the Jura, fertile in pasturage, and varied with woods, backs this beautiful tract. Near Laufanne the banks rise very considerably, and form a most charming terrace. A few miles beyond is a rapid descent. Near Vevay begins a plain, which is continued far beyond the end of the lake, but contracting, by the approach of the mountains, towards the lake. The colour of the water is extremely beautiful, clear, and at a distance seems of a most lovely blue.

Near Geneva the coast abounds in small pebbles covered with a brown incrustation; from thence, as far as Laufanne, the shores are sandy; between that town and Chillon appear ledges of rocks, hard and calcareous; and the extremity of the lake is a marsh formed by the collected mud of the Rhone. The depth is various; M. De Luc asserts, that on sounding it, he had found the greatest depth to be 160 fathoms. The surface of the lake is said to be 1230 feet, and its deepest part 837 feet above the Mediterranean; like all inland lakes enclosed within high mountains, it is subject to sudden storms. The skins of the tippet grebes, which appear in December and retire in February, because this lake is almost totally destitute of reeds and rushes, in which they form their floating nest, are an elegant article of luxury, and sell for about 12 or 14 shillings each. This lake abounds in fish, remarkable both for their quality and size.

GENEVA is also a lake in Upper Canada, which forms the western extremity of lake Ontario, to which it is joined by a short and narrow strait.

GENEVA, *New*, a thriving post-town of America, on the bank of the Monongahela river, just below George's creek, about 18 miles N. of Morgantown; this town is rendered famous as a place of much business, partly by the glass-works in its vicinity, which not only supply the neighbourhood with window-glass bottles, &c. but send large quantities down the river. Here is also a paper-mill, and a manufactory for muskets. Small boats are also built in this place.

GENEVA, *New*, a village of the county of Waterford, Ireland, nearly opposite to Duncannon fort, where many good houses were erected several years ago by government for the reception of the expatriated citizens of Geneva, but  
they



they having relinquished the design of settling in Ireland, the place remains uninhabited.

Soon after the revolution of 1782, a memorial, signed by more than 1000 Genevans of both sexes, who were either persons of some property, or versed in trade or manufactures, expressing a desire of settling in Ireland, was presented to earl Temple (marquis of Buckingham) then the lord-lieutenant of Ireland. His excellency, apprized of the advantage which would redound to Ireland from the reception of so many industrious artists, many of whom possessed property in the English, Irish, and French funds, communicated, in September 1782, the proposal to the privy-council of Ireland for giving an asylum to the Genevan emigrants. This proposal, patronized by the lord-lieutenant, and unanimously consented to by the privy-council, was approved by the king. The Irish parliament voted 50,000*l.* towards defraying the expences of their journey, and building a town for their reception; lands were purchased for 8000*l.* and part of the town was actually completed at the expence of 10,000*l.*; a charter was granted, with very considerable privileges; the standard of gold was altered for the accommodation of the new manufacturers; the foundation of an academy, approved, upon an useful, extensive, and economical plan; in July 1783, several Genevans landed in Ireland; and when the nation had expended near 30,000*l.* the project was suddenly relinquished, and the settlement finally abandoned. The failure has been attributed to delays in the arrangement of so complicated a plan, occasioned by the high demands of the Genevan commissioners, who, in preparing the charter, required many privileges, that were contradictory to the laws of the land, and by the building of New Geneva. In consequence of these delays, and the repentment of the Genevans, many returned and took the oaths of allegiance to the new government. The project became gradually less popular; the few Genevans, who prematurely landed in Ireland, were discontented, at not finding the new town ready for their immediate reception; and the emigrants who possessed most property, having withdrawn their names, the rest wanted sufficient capital to settle in a foreign country, and to establish an extensive manufactory without still farther assistance. In consequence of this deficiency, the Genevan commissioners petitioned to appropriate 10,000*l.* of the 50,000*l.* for the purpose of forming a capital. But, as that sum had been voted by parliament for other purposes, the petition was rejected; and the Genevans, in an address to the duke of Rutland, who succeeded lord Temple as lord-lieutenant, relinquished the settlement, and soon afterwards quitted Ireland.

**GENEVIEVE, ST.**, a town of France, in the department of Paris; 6 miles W. of Paris.—Also, a town of France, in the department of the Aveyron, and chief place of a canton, in the district of Espalion; 27 miles N. of Rhodéz. The town contains 1241, and the canton 6777 inhabitants, on a territory of 175 kilometres, in 17 communes.—Also, a town, or village, of America, in Louisiana, on the western bank of the Mississippi, 12 miles southerly of fort Chartres. It contained, some years ago, more than 100 houses, and 460 inhabitants, besides negroes. N. lat. 37° 35'. W. long. 90° 44'.—Also, a town of Canada, on the Batiscan. N. lat. 46° 38'. W. long. 72° 14'.

**GENEVIEVE, St. Genevieve, or St. Genevieve,** fathers or religious of St. Genevieve, the name of a congregation of regular canons of the order of St. Augustine, established in France.

The congregation of St. Genevieve is a reform of the Augustine canons. It was begun by St. Charles Faure, in

the abbey of St. Vincent de Senlis, whereof he was a member, in the year 1618.

In the year 1634, the abbey was made elective; and a general chapter, composed of the superiors of fifteen houses who had now received the reform, chose F. Faure coadjutor of the abbey of St. Genevieve, and general of the whole congregation. Such was its beginning.

It has since increased very much, and has consisted of above a hundred monasteries; in some of which the religious are employed in the administration of the parishes and hospitals; and in others, in the celebration of divine service, and the instruction of ecclesiastics in seminaries for the purpose.

The congregation takes its name from the abbey of St. Genevieve, which is the chief of the order, and whose abbot is the general of it. The abbey itself took its name from St. Genevieve, the patroness of the city of Paris, who died in the year 512. Five years after her death, Clovis erected the church of St. Genevieve, under the name and invocation of St. Peter, where her relics have been preserved, her shrine visited, and her image carried with great processions and ceremonies, upon extraordinary occasions, as when some great favour is to be intreated of heaven.

**GENEVIEVE Bay,** in *Geography*, a bay on the W. coast of Newfoundland, in the straits of Belleisle; 20 miles N. of St. John's bay.

**GENEVÓIS, or DUCHY of GENEVA,** a province of Savoy, bounded on the N. by the Swiss territories, on the E. by Faucigny, on the S. by Savoy Proper, and on the W. by France, from which it is separated by the Rhône. Geneva and its territory formerly made a part of it. It is now annexed to France.

**GENEVRAY,** a town of France, in the department of the Isere; 10 miles S. of Grenoble.

**GENEURO,** a mountain which divides Piedmont from the ancient Dauphiny, in the road from Briançon to Susa.

**GENGA, GIROLAMO,** in *Biography*, a painter of very considerable celebrity in his day. He flourished at the early period of the revival of the art, being born at Urbino in 1476. At the age of 15 he studied under Luca Signorelli of Cortona, then in great esteem, and assisted his master in most of his undertakings in different parts of Italy, but particularly at Orvieto, being acknowledged the best disciple of that school. He afterwards spent three years with Pietro Perugino, at the same time that Raphael was under the tuition of that artist; and that intercourse laid the foundation of a most cordial friendship between Raphael and Genga, which never was impaired.

He was highly encouraged by Guido-Baldo II., and his successor, Francesco Maria III., dukes of Urbino, in their palaces and theatres, and in designing triumphal arches. In Rome, Sienna, Forli, Pesaro, and many other places, he left behind him an incalculable number of works, both in painting and architecture, which were held in great esteem, and which procured him honour and riches. He died of a fever in 1551, aged 75, leaving two sons, one of whom, Bartolomeo, followed the profession of his father in the same style, and was moreover an eminent statuary and architect.

**GENGA, BERNARDI,** a doctor in philosophy and medicine, was born in the duchy of Urbino. He was a teacher of anatomy and surgery at Rome about the middle of the 17th century; and, according to Mangetus, surgeon to the hospital of the Holy Ghost in that city. He was a man of firm understanding, and maintained the doctrine of the circulation of the blood, when it was not generally admitted in Italy; but he attributed the discovery of it to Paul Sarpi.

He also ventured to accuse Hippocrates of committing such errors, in the cure of several surgical diseases, as would not be pardoned in a student. His works are, 1. "Anatomia Chirurgica;" or "Historia dell' ossa e muscoli del corpo umano, con la descrizione de' vasi;" Rome, 1675, 1687. 2. "Anatomia per uso ed intellig. nza del disegno;" Rome, 1691. This work contains some good figures of the ancient statues. Genga prepared the bodies, by disposing the bones and muscles in the forced attitudes of the gladiators in their combats: and Lancisi added explanations of the figures. 3. "Comentaria Latina et Italica ad Hippocratis Aphorismos, ad Chirurgiam pertinentia;" Rome, 1694, 8vo. Bonon. 1697, 8vo. Eloy.

GENGENBACH, in *Geography*, an imperial town of Germany, in the circle of Swabia, situated on the Kinzig, in the Ortenau: in this town is an abbey, whose prelate was a prince of the empire. Among the indemnities agreed on at Ratiboa in 1802, this town and abbey were given to the margrave of Baden; 15 miles S.E. of Straßburg. N. lat. 48° 27'. E. long. 8° 1'.

GENGOU-LE-ROYAL, *St.*, a town of France, in the department of the Saône and Loire; celebrated for its wine; 11 miles N. of Cluny.

GENIAL, GENIALIS, an epithet applied by the ancients to certain deities, whom they supposed to preside over generation.

They were thus called *a genulo*, from bearing; or, according to the correction of Scaliger and Vossius, *a genulo*, to year, produce: yet Festus says, that they were also called *geruli*, which seems to require the former reading. M. Dacier, in a note, shews that *genere* has the sense of *procreant*.

Among the genial gods, *dei geniales*, says Festus, were water, earth, fire, and air, which the Greeks called *elements*. The twelve signs were sometimes also ranked in the number; as also the sun and moon.

GENICULATUS, *CULMUS*, in *Botany*, a straw bent like the knee, as in *Alopecurus geniculatus*; see *CULMUS*; and *CAULIS*. n. 19.

GENICULI, the joints or knots which appear in the shoots of plants; whence botanists call those marked therewith geniculate plants.

GENIE. See *GENIUS*.

GENIES, *St.*, in *Geography*, a town of France, in the department of the Aveyron, and chief place of a canton, in the district of Espalion; 18 miles E.N.E. of Rhodéz. N. lat. 44° 28'. E. long. 3° 3'. The place contains 3333, and the canton 7988 inhabitants, on a territory of 202½ kilometres, in 8 communes.—Also, a town of France, in the department of the Gard; 9 miles N.W. of Nîmes.—Also, a town of France, in the department of the Lower Alps; 6 miles N.E. of Sisteron.

GENII, in *Mythology*. See *GENIUS*.

GENILLE, in *Geography*, a town of France, in the department of the Indre and Loire; 3 miles N. of Loches.

GENIO-GLOSSUS, in *Anatomy*, (from *glossa*, the *chin*, and *glossa*, the *tongue*;) a large muscle belonging to the tongue. See *DEGLUTITION*.

GENIO-HYOIDTUS, from *glossa*, the *chin*, and *hoidn*, an epithet given to the bone of the tongue, is a muscle belonging to the os hyoides. See *DEGLUTITION*.

GENIO-PHARYNGEUS, from *glossa* and *pharynx*, a name given by Winslow to a particular slip of the constrictor pharyngis superior.

GENIOSTOMA, in *Botany*, from *glossa*, a *beard*, and *stoma*, the *mouth*, because the orifice of the flower is beset with a dense fringe. Forst. Gen. t. 12. Schreb. 131.

Willd. Sp. Pl. v. 1. 998. Mart. Mill. Dict. v. 2. Juss. 420. Lamarck Illustr. t. 133, merely copied from Forster.—Class and order, *Pentandria Monogynia*. Nat. Ord. "uncertain," Juss. *Apocinea* 2

Gen. Ch. *Cal.* Perianth inferior, turbinate, permanent, with five acute segments. *Cor.* of one petal, funnel-shaped; tube dilated upwards, longer than the calyx, its orifice bearded; limb spreading, in five deep, ovate, rather pointed segments, as long as the tube. *Stam.* Filaments five, short, in the tube of the corolla; anthers oblong, prominent. *Pist.* Germen superior, ovate; style thread-shaped, longer than the tube; stigma cylindrical, obtuse, furrowed. *Peric.* Capsule? oblong, of two cells. *Seeds* numerous, somewhat angular, ranged along a thread-shaped receptacle.

Ess. Ch. Corolla funnel-shaped, bearded at the mouth. Calyx inferior, with five segments. Stigma cylindrical, abrupt, furrowed. *Pericarp* of two cells, with many seeds.

1. *G. rubesfris*. Forst. Prod. 17. Native of rocky places in the island of Tanna. *Stem* shrubby, climbing without tendrils, branched in an opposite manner, round, with a smooth grey bark. *Leaves* opposite, about three inches long, elliptic-lanceolate, pointed, entire, slightly wavy, smooth, opaque, with one rib, and a few remote, curved, interbranching veins. *Footstalks* slender, smooth, channelled, half an inch long. *Stipulas* intrafoliaceous, united, short, acute, rather membranous. *Flowers* small, in solitary, forked, opposite, somewhat downy, axillary panicles, rather longer than the footstalks. *Bractees* short, acute, united at their base, in pairs under each fork of the panicle. *Calyx* minutely fringed. *Corolla* apparently reddish.—From one of Forster's own dried specimens. Jussieu probably never saw the plant, or we think he would have referred it to his *Apocinea*. No figure has been published, except of the fructification.

GENIPA. (See *GARDENIA*.) The name is barbarous, of West Indian origin, and appears to be sometimes called *Genipat*. See *Tournefort*, 658.

GENIPABU, in *Geography*, a river of Brasil, which runs into the Atlantic, S. lat. 5° 35'. W. long. 34° 46'

GENIS, *St.* a town of France, in the department of the Lower Charente, and chief place of a canton, in the district of Jonzac; 24 miles S. of Saintes. The place contains 862, and the canton 12,600 inhabitants, on a territory of 212½ kilometres, in 17 communes.—Also, a town of France, in the department of Mont Blanc, and chief place of a canton, in the district of Chambéry, near the conflux of the Rhône and Guiers; 15 miles W. of Chambéry. The place contains 1550, and the canton 7965 inhabitants, on a territory of 112½ kilometres, in 12 communes.

GENIS la Val, *St.* a town of France, in the department of the Rhône, and chief place of a canton, in the district of Lyons; 4 miles S. of Lyons. The place contains 2400, and the canton 15,522 inhabitants, on a territory of 97½ kilometres, in 10 communes.

GENISTA, in *Botany*, Green-weed, or Dwarf Broom. The etymology seems not very clear, either from *genu*, a knee, in allusion to the bending of the twigs, or from *geno*, to produce, because it grows wild in abundance; yet such are proposed by the learned, and we have no better to offer. Linn. Gen. 368. Schreb. 488. Willd. Sp. Pl. v. 3. 936. Sm. Fl. Brit. 754. Mart. Mill. Dict. v. 2. Juss. 353. Lamarck Illustr. t. 619. Gærtn. t. 151. Class and order, *Dialuphia Decandria*. Nat. Ord. *Papilionacea*, Linn. *Leguminifera*, Juss.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, small, tubular, two-lipped; the upper lip with two teeth, more deeply divided;

divided; lower with three nearly equal teeth. *Cor.* papilionaceous: standard oblong, remote from the keel, entirely reflexed; wings oblong, lax, shorter than the other petals; keel straight, emarginate, longer than the standard. *Stam.* Filaments ten, all united, emerging from the keel; anthers simple. *Pist.* Germen oblong, enveloped by the common filament; style simple, directed upwards; stigma acute, involute. *Peric.* Legume roundish or oblong, turgid, of one cell and two valves. *Seeds* several, molly kidney-shaped, with a smooth elevated border round the scar.

*Eff. Ch.* Calyx two-lipped, the upper lip with two teeth, lower with three. Standard oblong, bent backwards from the rest of the flower.

A genus of shrubs, almost entirely European, with tough angular stems and branches, either ternate or simple leaves, and yellow flowers. Willdenow has twenty-five species, eighteen of which are unarmed, the other seven furnished with spines, in many instances remarkably compound. The spinous ones have all simple leaves. Three *Genista* are natives of Britain.

*G. tinctoria.* Engl. Bot. t. 44. Dyer's Green-weed. So called from its use in dyeing yellow, and, with the addition of woad, green. Ray says it gives a bitter flavour to the milk of cows that feed upon it.

*G. pilosa.* Engl. Bot. t. 208. Hairy Green-weed. Found only on high sandy ground about Bury, Suffolk, at the foot of Cader Idris, North Wales, and on leap rocks near the Lizard point. It grows quite prostrate, and is difficult to find except in May, when it flowers copiously and forms a rich golden carpet. Mr. Rose first described this as an English plant, and figured it in his Introduction to Botany, appendix 452. t. 3.

*G. anglica.* Engl. Bot. t. 132. Needle Green-weed, or Petty Whin. This is our only spinous species, and its spines are very conspicuous, long, simple, and spreading. *Stem* of humble growth, but nearly erect. *Flowers* not inelegant, turning green when dried. It is frequent on moist turfy or sandy heaths, blossoming in May and June.

*G. caudicans, sibirica, florida,* and *triquetra,* are hardy garden plants, worthy of cultivation for their beauty or singularity. The first especially has a showy appearance when trained against a wall. *G. canariensis,* and *linifolia,* Curt. Mag. t. 442, are rather greenhouse shrubs, and the latter is very elegant on account of its silky silvery leaves. It grows in Switzerland as well as in Spain, but like many other alpine plants, does not well bear our winters.

**GENISTA,** in *Gardening*, comprehends plants of the low shrubby evergreen and deciduous kinds, of which the species chiefly cultivated are, the common dyer's broom (*G. tinctoria*); the jointed broom (*G. sagittalis*); the Spanish dyer's broom (*G. florida*); the hairy broom (*G. pilosa*); the English genista petty-white, or needle furze (*G. Anglica*); the hoary genista, or Montpellier cytifus (*G. caudicans*); and the Canary genista or cytifus (*G. canariensis*.)

*Method of Culture.*—The six first sorts are all of the hardy kind, and capable of being increased by sowing the seeds in beds of common mould, and, which is better, in the borders or clumps where they are to remain; but which should be done in the early autumnal or spring seasons, though the former is by much the better, as a great deal of time will be saved. In cases where they are raised in beds, the plants should be carefully taken up and removed, as soon as they have attained about twelve months' growth, into the situations in which they are to continue. In the latter mode of cultivation, they however require no other management than that of properly thinning them out, and keeping them free from all sorts of weeds.

The last, or Canary sort, may likewise be raised by sowing the seeds in pots of good garden mould in the spring season, but the aid of a moderate hot-bed is necessary to bring them forward. As soon as the plants have acquired a little growth they should be removed into separate small pots, and be immediately replunged in the hot-bed. In their after-management they demand the same sort of attention as other the tender kinds of green-house plants.

Each of the first six sorts are proper for the more forward parts of the clumps and borders in ornamented grounds, and have a good effect from the fine appearance of their flowers.

The last kind produces a variety among other evergreen plants in the green-house collections.

**GENIPA BRUM,** in *Geography*, a town of America, in Powhatan county, Virginia, 166 miles from Washington.

**GENIPA-NANA,** in *Mythology*, a goddess who presided over child-birth, to whom the Romans sacrificed a dog.

**GENITAL, GENITALIS,** in *Anatomy*, something that relates to generation; which see.

**GENITAL gods, dii genitales,** are sometimes used in the ancient Roman poets for those we otherwise call *indigites*.

Ausonius, in the argument of the fourth book of the *Æneid*, takes the word in a different manner: the *dii genitales*, he observes, were such a were not born of human parents, and were not thus called *quasi geniti ex hominibus*, but rather because they themselves had begot human children.

**GENITALIA, or GENITORES,** in *Anatomy*, a name sometimes given to the testes or testicles of a man, on account of their office in generation, which see.

**GENITE,** in *Geography*, a town of France, in the department of the Correze; 18 miles W. of Brive.

**GENITED,** in *Geometry.* See **GENERATED.**

**GENITES,** *Genetes,* or *Genetes,* among the *Hebrews*, those that descended from Abraham, without any mixture of foreign blood.

The Greeks distinguished by the names of genites such of the Jews as were issued from parents who, during the Babylonish captivity, had not allied with any gentile family.

**GENITIVE,** in *Grammar*, the second case of the declensions of nouns.

When one thing is represented as belonging to another, in the relation of cause, origin, or author, its name has a termination given to it, called the *genitive case*; and as the author is properly the owner of a thing, the genitive is also called the *possessive case*.

In English, the genitive case is made by prefixing the particle *of*; or it is expressed by an apostrophe, with the letter *s* coming after it, as "thy father's house:" when the plural ends in *s*, the other *s* is omitted, but the apostrophe is retained, as "on eagles' wings:" sometimes alie, when the singular terminates in *is*, the apostrophic *s* is not added: as "for righteousness' sake." In French the genitive is expressed by *de, or du, &c.* though, in strictness, there are no cases at all, or at most only two, in either of these languages, inasmuch as they do not express the different relation of things by different terminations, but only by additional prepositions. (See **CASE**.)

An ingenious grammarian observes, that though the termination called the genitive case be rendered by *of*; it means invariably *from, beginning, motive*; and this, he says, seems to be the true signification of *of*, if we regard its etymology, it being taken from  $\alpha\delta$ ,  $\alpha\tau\omega$ , *ab, from*; and though custom seems to have assigned it some different undeliable meaning, it is in all cases resolvable into

the sense of *from*. Thus, a table of wood is a table *from* wood, wood being the origin or beginning of it. Again, he is sick of love, *i. e.* sick *from* love, love being the cause of his sickness; and so in all other instances. And this is the reason why some prepositions which signify *origin* or *beginning* in Greek, Latin, and French, are rendered in our tongue by *of*. Jones's Greek Grammar, p. 194.

In the Latin, this relation is expressed in divers manners, thus we say, *caput hominis, the head of a man; color roseæ, the colour of a rose; opus Dei, the work of God, &c.*

As the genitive case serves to express very different, and even opposite relations, there sometimes arises an ambiguity from this circumstance; thus, in the phrase, *vulnus Achillis, the wound of Achilles*, the genitive, *Achillis*, may either signify passively the wound Achilles has received, or actively the wound Achilles has given: thus in that passage of St. Paul, *Certus sum quod neque mors, neque vita, &c. nos poterit separare a charitate Dei in Christo, &c.* the genitive *Dei* has been taken by interpreters in two different senses; some, giving it the relation of object, understand the passage of the love which the elect bear to God in Jesus Christ; whereas others give it the relation of subject, and explain it from the love which God bears the elect in Jesus Christ.

In the Hebrew tongue, the genitive case is marked after a manner very different from that of the Greek and Latin: for whereas in those languages the noun governed is varied, in the Hebrew the noun governing undergoes the alteration.

GENITO, *St.* in *Geography*, a town of Naples, in Calabria Citra; 21 miles N. W. of Bisignano.

GENIUS, in *Mythology*, a good or evil spirit, or *dæmon*, whom the ancients supposed set over each person, to direct his birth, accompany him in life, and be his guard until death. Those that attended women were females, and called *Junones*, but those that attended men were males, and called *Genii*. They seem, in their original, to be nothing else but the particular bent and temper of each person desired; and as every one's own temper is in a great measure the cause of his happiness or misery, each of these were supposed to share, and have an equal feeling in all the enjoyments and sufferings of the persons they attended. (See Horace, lib. ii. ep. ii. ver. 189.) The ancients had their *Genii* of nations, of cities, of provinces, &c. Nothing is more common than the following inscription on medals: GENIUS POPULI ROM. "the Genius of the Roman people:" or, GENIO POP. ROM. "to the Genius of the Roman people." The ancient Gauls acknowledged *Genii*, who took care of each particular province and canton: but the foundation of the worship, which they paid to their desired cities, or rather to the genius who protected them, and became their tutelar divinity, was to engage them to take care of them, to defend them against enemies, and to remove from them all evils, with which they might be distressed; such as epidemical distempers, and other calamities. The names of these tutelar *Genii* were kept secret, lest, if they should be known, they should be conjured away, and forced to abandon the cities that were committed to their charge, and pass into others, where they were promised a more solemn worship.

In this sense, *genius* and *lar* were the same thing; as, in effect, Censorinus and Apuleius affirm they were.

Of these *genii* or *dæmons*, Plato supposes that every man has his own, who is his guardian, and his witness, not only of his actions, but of his very thoughts; but that, at death, the genius delivers up to judgment the person who had been committed to his charge; and if, when the person is interrogated by the judge, his answer be found not agreeable to truth, the genius censures and reprimands him very severely, as, on the other hand, he pronounces an encomium upon him

when what he says is true; and it is upon the approbation of the genius, that the doom is pronounced; for this *dæmon* knows whatever passes in the man, even his most secret thoughts.

Although Plato and Jamblichus were of opinion that every individual had but one of these *genii* to conduct him, and to preside over all his actions, other philosophers of the same school were persuaded, that he had two, the one good, the other bad. To this purpose Servius upon Virgil (*Æn. l. vi. c. 743.*) says, "Volunt unicuique genium oppositum, Dæmonem bonum et malum; hoc est, rationem quæ ad meliora semper hortatur, et libidinem quæ ad pejora; hic est Larva et genius malus; ille bonus genius et Lar." "They will have it that every one has two *genii*, the one good, and the other bad; that is, reason, which always excites men to good, and but, which prompts them to ill: the latter is what they call "Larva," or evil genius: the other good Genius, or "Lar."

The Platonists, and other eastern philosophers, supposed the *Genii* to inhabit the vast region, or extent of air, between earth and heaven. They were a sort of intermediate powers, who did the office of mediators between gods and men. They were the interpreters and agents of the gods; communicated the will of the deities to men; and the prayers and vows of men to the gods. As it was unbecoming the majesty of the gods to enter into such trifling concerns, this became the lot of the *genii*, whose nature was of a middle kind between the two; who derived immortality from the one, and passions from the other; and who had a body framed of an aerial matter. Most of the philosophers, however, held that the *genii* of particular men were born with them, and died. Thus Plutarch attributes the ceasing of oracles partly to the death of the *Genii*.

The heathens, who considered the *Genii* as the guardian spirits of particular persons, believed that they rejoiced and were afflicted at all the good and ill fortune that befel their wards. They never or very rarely appeared to them; and then only in favour of some person of extraordinary virtue or dignity. They likewise held a great difference between the *Genii* of different men; and that some were much more powerful than others; on which principle it was, that a wizard in Appian bids Antony keep at a distance from Octavius, because Antony's *Genius* was inferior to, and stood in awe of, that of Octavius.

There were also evil *Genii*, who took a pleasure in persecuting men, and bringing them evil tidings: such was that in Paterculus, &c. which appeared to Brutus the night before the battle of Philippi. These were also called *larvæ*, and *lemures*.

According to the theogony of Hesiod, the men of the golden age became *dæmons*, or good *genii*; those, according to him, are the guardians of men, the earth having fallen to their lot. Those of the silver age were changed into manes, or subterraneous *genii*, happy though mortal. Those of the brazen age went down to the infernal regions. Those of the heroic age took possession of the Fortunate islands, or the Elysian fields, situate at the extremities of the world. See *DÆMON*, and *DÆMON of Socrates*.

The Mahometans also admit the existence of *Genii*, supposed by them to be a class of intermediate beings, between angels and men; of a grosser fabric than the former, and more active and powerful than the latter. Some of them are good, and others bad; and they are, like men, capable of future salvation or condemnation.

GENIUS is more frequently used for the force or faculty of the soul considered as it thinks or judges.

Thus, we say, a happy genius, a superior genius, an elevated genius, a narrow confined genius, &c. in like sense we also say, a work of genius, a want of genius, &c.

*Genius* is also used, in a more restrained sense, for a natural talent, or disposition to one thing more than another. In which sense we say, a genius for verse, for the sciences, &c.

Dr. Blair, in his "Lectures on Rhetoric, &c." (vol. i.) distinguishes between Taste and Genius. Taste, he says, consists in the power of judging; Genius, in the power of executing. One may have a considerable degree of taste in poetry, eloquence, or any of the fine arts, who has little or hardly any genius for composition or execution in any of these arts. But genius cannot be found without including taste also. Genius, therefore, deserves to be considered as a higher power of the mind than taste. Genius always imports something inventive or creative; which does not rest in mere sensibility to beauty, where it is perceived, but which can, moreover, produce new beauties, and exhibit them in such a manner, as strongly to impress the minds of others. Refined taste forms a good critic; but genius is further necessary to form the poet, or the orator. Besides, genius is a word, which, in common acceptation, extends much further than to the object of taste. It is used to signify that talent, or aptitude, which we receive from nature, for excelling in any one thing whatever. Accordingly, we speak of a genius for mathematics, as well as a genius for poetry; or a genius for war, for politics, or for any mechanical employment. This talent or aptitude, for excelling in any one particular, is received from nature; and though it may be greatly improved by art and study, it cannot by them alone be acquired. As genius is a higher faculty than taste, it is more limited in the sphere of its operations. Whilst we find many persons, who have an excellent taste in several of the polite arts, such as music, poetry, painting, and eloquence, all together; it is much more rare to meet with one who is an excellent performer in all these arts. Indeed, an universal genius, or one who is equally and indifferently turned towards several different professions and arts, is not likely to excel in any. The rays must converge to a point, in order to glow intensely. A genius for any of the fine arts always supposes taste; and the improvement of taste will serve to forward and correct the operations of genius. But genius, in a poet or orator, may sometimes exist in a higher degree than taste; that is, genius may be bold and strong, when taste is neither very delicate, nor very correct. This is often the case in the infancy of arts; a period when genius frequently exerts itself with great vigour, and executes with much warmth; while taste, which requires experience, and improves by slower degrees, hath not yet attained its full growth. Homer and Shakspeare may be referred to as examples in proof of this assertion. (See TASTE.) Longinus, in his "Treatise on the Sublime," remarks, that liberty is the nurse of true genius: it animates the spirit, and invigorates the hopes of man; excites honourable emulation, and a desire of excelling in every art. It is observable, that writers and artists most distinguished for genius have generally appeared in considerable numbers at the same period. Besides the moral causes which have been alleged to account for this phenomenon, such as favourable circumstances of government and manners, encouragement from great men, and emulation excited among men of genius, the Abbé du Bos, in his "Reflections on Poetry and Painting," has collected a great many observations on the influence which the air, the climate, and other natural causes, may be supposed to have upon genius. The opinion of the Abbé du Bos, that genius chiefly depended on soil, food, air and climate, has been favoured by Montesquieu in his "Spirit of Laws;" and it occasionally occurs in other writers. Mr. Hume, however, has attacked this hypothesis with great ingenuity and strength of reasoning in his "Essay on National Cha-

acters." In that Essay he has clearly proved, that the differences we observe in nations, with regard to genius, science, and manners, arise from moral, and not from physical causes. (See CLIMATE.) The fact, however, is unquestionable, that some periods or ages of the world have been much more distinguished than others for the extraordinary productions of genius. (See AGE, in the *History of Literature*, &c.) If we institute a comparison between the ancients and moderns in this respect, we must allow, that while the advancing age of the world brings along with it more science and more refinement, its earlier periods may lay claim to more vigour, more fire, more enthusiasm of genius. Among the ancients, we find higher conceptions, greater simplicity, more original fancy; among the moderns, sometimes more art and correctness, but feebler exertions of genius. Admitting this to be in general a mark of distinction between the ancients and moderns, it cannot be admitted without exceptions; for, in point of poetical fire and original genius, Milton and Shakspeare are not inferior to any poets in any age.

GENIUS, is not a musical term, nor does it appertain to one of the polite arts more than another; but Rousseau (*Dict. de Mus.*) has volunteered an article for it among musical terms, and has written it with peculiar eloquence and enthusiasm.

Rousseau, paradoxical on almost all other subjects, is sometimes not only capricious, but mischievous; yet his bitterest enemies admit, that music is his bright side; and though he is not allowed by the present French musical critics to be a profound contrapuntist, yet his taste in music and poetry was refined, and of the highest class; and his views concerning dramatic music were enlarged, rational, ingenious, and free from all caprice and paradox.

GENLIS, in *Geography*, a town of France, in the department of the Côte d'Or, and chief place of a canton, in the district of Dijon. The place contains 707, and the canton 8599 inhabitants, on a territory of 187½ kilometres, in 27 communes.

GENNABA, a town of Persia, in Faristan, in the Persian gulf; 15 miles N.W. of Bender Rigg.

GENNADIUS I., in *Biography*, patriarch of Constantinople, was elected to that dignity, having been some years an ordained presbyter of the church, in the year 458, on the death of Anatolinus. In the following year, in a council of 73 bishops, he procured the passing of a canon against simoniacal ordinations, and established the equitable regulation, that the oblations made in the churches, which it had been customary to claim for the patriarch's treasury, should thenceforward belong to the officiating clergy. He died in 471, leaving behind him a high character for great zeal and disinterestedness in correcting the relaxed state of discipline which prevailed in his see. He is placed by those who lived about the same period among the ecclesiastical writers of the day, and is applauded for the extent of his learning and the elegance of his style. The proofs of this have not come to us, excepting in "A synodal Epistle" against simony, inserted in the fourth volume of the *Collect. Concil.*; and fragments against the mathemas of Cyril of Alexandria, quoted by Facundus, bishop of Hermiana, and another from a treatise addressed to Parthenius, and quoted by Leontius. Moreri.

GENNADIUS II., another patriarch of Constantinople, in the fifth century, assumed the name upon embracing the ecclesiastical life, having, prior to this, the name of George Scholarius. He was a native of Constantinople, where he was educated, and attracted much notice by his talents and remarkable progress in the different branches of learning. He became secretary to the emperor John Palæologus.

and afterwards chief judge of the Greeks. In 1438 he accompanied the emperor to the council at Florence for the purpose of bringing about an union between the Greek and Latin churches: it is, however, a matter of much doubt whether Scholarius was in favour of the measure which his duty to his master required him to sanction and support. After his return to Constantinople he united with Mark of Ephesus, in opposing the reception of these terms of union to which the emperor had acceded, as well by his influence as by his writings, which brought on him for a time the displeasure of the emperor. After the death of Palaeologus in 1448, Scholarius was as violent as ever against the proposed union, and finding that his opposition must subject him to danger with the new emperor, Constantine, he resolved to relinquish his civil employments, and to embrace the ecclesiastical life. He accordingly, in 1459, after sending a valedictory oration to the emperor, retired into a monastery adjoining Constantinople, and lived a secluded life for two years, which is supposed to have been the result of the emperor's orders, to prevent him from taking part against the proposed union. During his retreat from the world he composed several homilies, which could offend no one; but he did not engage in any controversy until the union was completed. This called forth his zeal in behalf of the Greek church: he wrote letters to all the ecclesiastics of Constantinople, and to the different monastic orders, exhorting them to adhere to the faith of their ancestors, and not to submit to the Florentine union: he also remonstrated with the emperor on the subject, but the monarch was not to be turned from his plan, and made every effort, by persuasion and by threats, to bring over Gennadius. The attempt was futile; he had gone too far to retract, and had obtained a multitude of adherents whom he had converted by his writings and exhortations, which represented the union to be a desertion of the cause of God and his truth. The emperor subscribed the act of union at Constantinople, as it had been ratified in the council of Florence. On the 12th of December 1452, the two nations, in the church of St. Sophia, joined in the communion of sacrifice and prayer. But the dress and language of the Latin priest who officiated at the altar were objects of scandal; and it was observed, with a feeling of horror, that he consecrated a wafer of unleavened bread, and poured cold water into the sacramental cup. From the dome of St. Sophia, the inhabitants of either sex, and of every degree, rushed in crowds to the cell of Gennadius to consult him, as the oracle of the church. He was invisible, and entranced, as it should seem, in deep meditation, or divine rapture; but he had exposed on the door of his cell a tablet, on which were written these words: "O miserable Romans, why will ye abandon the truth; and why, instead of confiding in God, will ye put your trust in the Italians? In abandoning your faith, you will lose your city. Have mercy on me, O Lord! I protest, in thy presence, that I am innocent of the crime. O miserable Romans, consider, pause, and repent! At the same moment that you renounce the religion of your fathers by embracing impiety, you submit to a foreign servitude." This was the signal for insurrection, (see CONSTANTINOPLE); and, after the capture of the city, the sultan Mahomet, desirous of conciliating those inhabitants who had survived the immense slaughter made by his army, and of recalling the Greeks, who had escaped, to their deserted houses, ordered Gennadius to be sought for, and offered him to the choice of the clergy and people, by whom he was immediately elected their patriarch. In the election and investiture of Gennadius, the ceremonial of the Byzantine court was revived and imitated. With a mixture of

satisfaction and indignation, they beheld the sultan on his throne, who delivered into the hands of Gennadius the pastoral staff, the symbol of his ecclesiastical office, who conducted the patriarch to the gate of the seraglio, presented him with an horse richly caparisoned, and directed the viziers and bashaws to lead him to the palace which had been allotted for his residence. The churches of Constantinople were shared between the two religions: their limits were marked, and till it was infringed by Selim, the grandson of Mahomet, the Greeks enjoyed above sixty years the benefit of this equal partition. Gennadius presided over the see of Constantinople between five and six years, when he resigned his dignity, and retired into a monastery. He died about the year 1460. He was author of "An Explanation of the Christian Faith, delivered before the Turkish emperor Mahomet." This work was the result of a long conversation which he had with the emperor, soon after his installation, when Mahomet suffered him to produce all the arguments he was able in support of the truth of Christianity. It is to be found in Crusier's *Turco-Græcia*; and is also in David Chyzerus's "*De statu Ecclesiarum in Græcia*." Gennadius wrote likewise a treatise concerning predestination, and another on the trinity. He composed many homilies in the early part of life, which were delivered before the emperor, as orations, which laymen were, in that age, accustomed to pronounce in the imperial dining-room. Moreri. Gibbon's Hist.

GENNADIUS, an ecclesiastical writer, flourished towards the close of the fifth century, and became priest of Marseilles. He was a great writer, and is said to have composed eight books against all heresies, six against Nestorius, three against Pelagius, and a treatise concerning the millennium and the book of Revelation; but the only works remaining of this author are entitled "*De viris illustribus*," which is a continuation of St. Jerome's catalogue of Ecclesiastical Writers; and a treatise "*De Fide, seu de dogmatibus Ecclesiasticis Liber ad Gelasium Papam missus*." This last was for a considerable time attributed to St. Augustine, and was generally inserted in the editions of his works. The time of Gennadius's death is not known, but it did not take place before the year 395.

GENNARI, CESARE and BENEDETTO, two brothers who both made painting their profession. They were nephews, heirs, copyists, and imitators of Guercino; they frequently repeated his pictures, but not with adequate sweetness or force. At first they wrought together at several places in Italy; but separating, Cesare remained at Bologna, and Benedetto went to England, where there are many of his works, particularly at Windsor Castle, discoverable by a laboured, dry imitation of Guercino; with a mixture of the flutter and parade exhibited by the French painters of that period. He was made painter to James II. and executed a picture of that prince and his family. At their expulsion he returned to Italy; and as his manner, by the mixture of French art he had introduced, was novel, he obtained applause and employment. He died in 1715, aged 82.

GENNE, in *Geography*, a town of France, in the department of the Maine and Loire, near the Loire; 9 miles N.W. of Saumur.

GENNEP, a town of France, in the department of the Roer, situated on the Niers, near the Menie. It contains two churches, one for Roman Catholics, and another for Protestants; 9 miles S. S. W. of Cleves. N. lat. 51 47. E. long. 5 50.

GENNES, a town of France, in the department of the Maine and Loire, and chief place of a canton, in the district



district of Saumur; 5 miles N.E. of La Guerche. The place contains 1455, and the canton 8248 inhabitants, on a territory of 190 kilometres, in 15 communes.

GENOA, and since the French revolution the "Ligurian republic," is a small, mountainous territory, in the northern part of Italy, forming a kind of crescent along the Mediterranean sea on the south, and covered on the land side by the Apennines, which separate it from the countries of Milan, Piedmont, the Montferrat, the Milanese, and Parmesan. Its length from the town of Vintimiglia on the west, almost to the territory of the republic of Lucca on the east, is about 150 miles, and its greatest breadth, from the sea to the interior of the country, is not more than 20 miles. The mountains that enclose it are, in some places, covered with forests, in others they are barren rocks, and in some few parts they yield excellent pasture. There is but a small quantity of arable land in this country, so that it is under a necessity of seeking a supply of corn from Naples, Sicily, and other places; but the inhabitants avail themselves of every spot which is capable of cultivation. They are furnished throughout the year with excellent legumes and vegetables for the table; they also make a considerable quantity of wines, and are amply provided with various kinds of fruit, especially citrons, oranges, pomegranates, almonds, and figs. They raise a great number of mulberry trees for feeding silk-worms, and olives grow in great plenty, particularly round the gulf of Spezzia. Salt is produced for exportation. The Apennines, and some other hills, supply them with excellent marble, while Polzevera, in the Bocchetta, yields the beautiful stone so called, being serpentine of various colours veined with marble, which is easily conveyed by a magnificent road formed, in 1778, from the Bocchetta, or mountains to the north of Genoa, through the Polzevera, by three years' labour of from five to eight hundred men, at the expence of one patriotic and noble family, the Cambiasi. The inhabitants of this country, amounting to about 400,000, are Roman Catholics, though the papal power is not much venerated; the people being devoted to commerce, and disposed to receive monied heretics, without any religious scruples. The manufactures were formerly very considerable, but they have of late declined; the principal are velvet, plush, damask, different kinds of silk, for which they are supplied with the raw material from Messina and other places; gold and silver stuffs, lace, gloves, stockings, ribbons, soap, paper, &c. Other articles of commerce are, oil, fruit, macaroni, confectionary, Parmesan cheese, anelovics, &c. Although Genoa is a free port, Leghorn, which is likewise free and indulged with greater liberty, interferes with its trade, and diminishes it. This country is part of the ancient Liguria (see LIGURIA); which, in the second Punic war, espoused the interest of the Carthaginians; but the city of Genoa, which was then a celebrated emporium, taking part with the Romans, was plundered and burnt by Mago the Carthaginian. It was afterwards rebuilt by the Romans, and continued under their dominion, together with the rest of Italy, till the conclusion of the fifth century, about A. D. 498, when Theodoric, king of the Goths, having defeated the usurper Odoacer, was proclaimed by the army king of Italy, even with the consent of the emperor Zeno. Genoa was afterwards recovered by Belisarius, when he entirely subdued the Goths; and when the Lombards invaded Italy, this city remained for some time unmolested, deriving an accession of wealth and inhabitants by the refugees who fled from the vicinity of the Po, in order to escape the fury of the invaders. At length, in the seventh century, Genoa was plundered and burnt by the Lombards, and remained under

their power till Italy was conquered by Charlemagne, when the territory of Genoa, distinguished by its wealth and populousness, was erected into a marquissate. It soon afterwards became so powerful, under the Genoese empire, and after it had obtained a kind of independence, that, in 806, it reduced the island of Corsica, and in 935 defeated the Saracens, who had plundered and burnt the city, in their return to Africa, on the coast of Sardinia. About the year 950, when the Franks having lost all authority in Italy, the Genoese began to form themselves into a kind of aristocratical republic, under a chief called *doge*, (see DOGE,) elected every two years, and to be governed by their own magistrates, who were freely elected, and took the name of consuls. In order to maintain their independence, they applied, with great assiduity, to navigation and commerce, and thus became rich and powerful. Their commerce extended from Spain to Syria, and from Egypt to Constantinople, and was carried on in vessels, that were fitted for war as well as traffic. In the year 1017 they united with the Pisans in an expedition against Sardinia; and about 33 years after this expedition, the Genoese and Pisans were engaged in a destructive war, which lasted nearly 18 years; but when a treaty of peace and alliance was concluded between them, they concurred in a successful expedition against the Moors, in Africa. What contributed more than any other circumstance to the opulence and grandeur of the Genoese, was the part they took in the crusades, and the important services they rendered to the religious warriors, towards the close of the eleventh and commencement of the twelfth centuries. During the latter century, they subjected the half of Sardinia, and the city of Syracuse; they also made themselves masters of the Black sea, formed establishments in the Crimea and in the suburbs of Pera, at Constantinople, where they remained till the Turks took that city. In the thirteenth century, they added to their conquests the towns of Albengo, Savona, Vintimiglia, and others in their neighbourhood; and for the superiority of the sea, they engaged in a long and obstinate contest with the Venetians, which did not terminate till the year 1381. In their various conflicts with neighbouring powers, their strength was enfeebled, so that, in 1471, they were expelled from the Crimea; though their maritime power still continued respectable. Exhausted by the Venetian war, in particular, Genoa offered voluntary subjection to France and to Milan; but after many revolts and conflicts, with a view of recovering their independence, they were at length, *viz.* in 1528, rescued from the dominion of foreign princes, by the vigorous exertions of Andrew Doria. Doria, having driven out the French, and gained possession of Genoa, assembled the nobility, and restored the government into their hands, declaring that he pretended to no greater share in it than became him as a nobleman. He re-established the ancient form of the republic, and received from his country all those testimonies of gratitude, which a conduct so disinterested seemed to deserve. (See DORIA.) Towards the end of the sixteenth century, Genoa was distracted by a civil war; but after a reconciliation had been effected between the two contending parties, distinguished by the appellations of the old and new nobility, the republic enjoyed peace and felicity for an interval of 48 years, during which period scarcely an incident, domestic or foreign, occurred, that is worth recording. In the year 1625, a dispute arose between the republic and Charles Emanuel, duke of Saxony, in which Lewis XIII. bore a share; and a treaty was concluded between France and Savoy, that was hostile to the Genoese. On this occasion the Spaniards declared in favour of Genoa; and a peace

peace with France and Savoy restored the republic to its former situation, at the commencement of the war. In 1636, the Spaniards attempted to surprize the city; but their enterprize was frustrated; and from this time till the year 1656, Genoa enjoyed all the blessings of peace and commerce. In the following year Hippolito Centurioni, the Genoese admiral, gained several advantages over the corsairs of Barbary, which paved the way for a treaty of commerce that was concluded with the piratical states, and the grand signior. The treaty with the Porte was considerably extended by the marquis Durazzo, who went in quality of ambassador to Constantinople in the year 1666. The result of this treaty renewed the vigour of the Genoese trade, to a pitch beyond what any of the maritime towns had experienced since the Dutch founded their commercial republic, and extended their trade not only to the Levant, but to every quarter of the globe. For some years Genoa lived in peace with all the neighbouring powers, enjoyed domestic harmony, and assiduously cultivated commerce, and whatever should render the republic powerful and happy. Some little jealousies and differences arose between her and Venice, the sister and rival republic; but they were such as terminated amicably, and never caused any disturbance to the repose of Italy. In the year 1684, the Genoese unfortunately incurred the resentment of Lewis XIV., who looked with jealousy on their attachment to Spain; and could not bear to see the republic under the protection of that crown. His attempts for humbling them proved too successful; but in consequence of their submission, and the interposition of the pope, peace was obtained. The terms stipulated by the French were peculiarly severe and oppressive; among others, they required that the doge and four counsellors should appear in person at Versailles, in order to sue for pardon; and that the state should disarm all their galleys, six excepted, with a promise not to fit out more, without the knowledge and consent of the king. During the ensuing war, kindled by the ambition of Lewis, which embroiled the greatest part of Europe, the republic of Genoa adhered wisely to a neutrality, and enjoyed the advantages of peace and commerce, while the dominions of their neighbour, Victor Amadeus, duke of Savoy, underwent all the calamities of war. In 1713, Charles VI. sold the marquise of Finale to the republic for a considerable sum of money. In 1743, the queen of Hungary, having at the treaty of Worms ceded to the king of Sardinia all her rights to the town and marquise of Finale, and demanding that the Genoese should deliver up the marquise, they entered into an alliance with France, Spain, and Naples; and, in 1745, declared war against the king of Sardinia who had made himself master of a great part of the state; several Genoese ports were bombarded by an English fleet; and the Imperialists seized upon the city of Genoa; but after a dreadful slaughter on both sides, they were again driven out by the inhabitants; and, in 1747, miscarried in their attempt to recover it. The treaty of Aix-la-Chapelle, in 1748, restored its tranquillity. The ancient nobility consist of 28 families, whom Andrew Doria, in 1528, separated from all the rest, and declared to be only capable of holding the chief offices and dignity of doge; all the other inhabitants being reduced by him to the class of commoners. Since that time it has been found necessary to create other nobility. The nobility of Genoa were allowed to keep manufactures of velvet, silk, and cloth; to farm the duties, and to have shares in merchant vessels; but all other business and handicrafts were forbidden. The form of government in this republic was aristocratical; the chief being called doge. This government continued till

the year 1798, when the French form was chosen, and the new style assumed of the Ligurian republic, confirmed by the more recent treaty of February 1801. The troops of this state, including the militia, may amount to about 30,000; and the fleet, anciently so celebrated for its victories over the Saracens, the Pisans, the Venetians, Spaniards, and Turks, and for maintaining during a long period a considerable dominion over Sardinia, Corfica, Malta, Majorca, Minorca, Candia, Cyprus, and many other places in and near the Mediterranean and Archipelago, and even the Black sea, the Crimea and other parts, is now reduced to a few gallees.

GENOA, or *Janua*, frequently, though corruptly, called by the Latin writers *Janua*, is the capital of the country described in the preceding article. It is situated partly on a level strand near the sea, and in part rises gradually to the top of the hill. It is about 10 miles in circumference, and is defended towards the land by a double wall. Several bastions are erected along the sea-shore, on rocks which appear above the water. The streets are in general narrow, but clean and well paved; two of which, called the "Strada Nuova" and "Strada Balbi," are filled with magnificent palaces, fronted with marble. It is the see of an archbishop. The cathedral is built in the Gothic style, and paved with black and white marble; in the treasury is preserved a curious hexagonal dish, said to be made of a single emerald, found at Casarea in the time of the Crusades, which the Genoese received as their share of the plunder. Besides the cathedral, it contains 32 parish churches, some of which are magnificent, and adorned with sculptures and pictures by the best masters. The doge's palace is large, without decoration, except two statues of John Andrew Doria, and Andrew Doria, larger than life, at the entrance. The arsenal contains arms for 34,000 men, models for bridges, the armours worn by a number of the Genoese women in the crusades, a shield containing 120 pistols, made by Julius Cæsar Vacche, for the purpose of assassinating the doge and senate at one time. Other public buildings are the Albergo, which serves as a poor-house, and house of correction, where is a beautiful relievo, the Virgin supporting a dead Christ, by Michael Angelo, and the assumption of the Virgin, in white marble, by Puget, an inimitable piece of sculpture; a large hospital for the sick of all nations and religions; the conservatory, for educating and portioning 300 poor girls; and a great number of palaces belonging to the nobility; and the number of convents for men and women is reckoned to be 69. Such was the state of Genoa before the late revolution; what devaluation it has suffered by its new masters, we are not able to say. It is certain, that the siege in 1799 was very destructive. The harbour is large and deep, but exposed to the south-west wind; but it has a mole for the security of gallees and small vessels; nevertheless the city is much exposed to a bombardment. The number of inhabitants is estimated at 80,000. N. lat. 44° 25'. E. long. 8° 58'.

GENOA *Bar*, a reef of rocks, extending some miles from the north coast of the island of Bahama. N. lat. 26° 20'. W. long. 79° 36'.

GENOA *Balsam*, in *Medicine*, the name of a famous composition, called also the balsam of Aquapendente. Its great virtues are the curing pains in the extremities of the body, and allaying the violent pains in the bowels, to which many women are subject after delivery. The prescription is given at large in Velscius, but the medicine is now out of use.

GENOLA, in *Geography*, a town of France, in the department of the Stura; three miles N. E. of Savigliano.

GENOLHAC, a town of France, in the department of the

the Gard, and chief place of a canton, in the district of Alais; 15 miles N. W. of Alais. The place contains 1,502, and the canton 9,59 inhabitants, on a territory of 195 kilometres, in 13 communes.

**GENOPLSIUM**, in *Botany*, from *γένος*, a genus, and *πλάσιον*, a early akin, indicating its great affinity to *Protophyllum*, another new orchidean genus of Mr. Brown's. The name is but too expressive of many genera recently established, inasmuch that it is wonderful no writer has hit upon it before. Brown Prod. Nov. Holl. v. 1. 319. Class. and order, *Gynandria Monandria*. Nat. Ord. *Orchidæ*.

Gen. Ch. *Cal.* Perianth ringent, helmet-like in front, its two lower or posterior leaves longer and spreading. *Cor.* Petals, (inner calyx-leaves of Mr. Brown,) attached below to the column. Nectary, or lip, ascending, undivided, hooded at the base, without a spur. *Style*, or column, cloven half way down, without any lateral membranous segments, in which last particular alone it differs from *Protophyllum*. *Anther* parallel to the stigma, permanent, its cells close together. Masses of pollen not observed. The only species is

*G. Baueri*, seen by Mr. Brown growing near Port Jackson, New South Wales, but the above character was drawn up by him from Mr. Ferdinand Bauer's coloured figure.

**GENOSA**, in *Geography*, a town of Naples, in the province of Otranto; 10 miles S. E. of Otranto.

**GENOVESI, ANTHONY**, in *Biography*, a man of letters, and philosopher, was born of parents of very moderate circumstances, at Castiglione, a small town in the district of Salerno, in the year 1712. He was intended for the church, and received an education suitable to the purpose. An early attachment to the daughter of a neighbouring peasant induced his father to place him, at a distance from home, under the care of a lay ecclesiastic, who was an able classical scholar, as well as deeply skilled in theology and jurisprudence. Here the young man made such progress in learning as astonished all about him. His resolution to marry the object of his love created in him a zeal and diligence that surmounted all difficulties; before, however, he was in a situation to maintain a wife, she, at the instigation of his father, married. This disappointment made him resolve to devote himself to the church, and he was in due time consecrated a priest, and obtained the patronage of the archbishop of Conza. Unfortunately for Genovesi the prelate died, which made him repair to Naples, to follow the practice of the law, an employment highly lucrative in that city. He was soon dissatisfied with his business, and after diligently studying the elements of modern and ancient philosophy, he obtained the office of extraordinary-professor of metaphysics. He began his lectures in November 1741, and his school was crowded with pupils; the boldness of his manner, and the novelty of many parts of his system, excited his enemies, who accused him not only of infidelity, but of opening the door of free-thinking in Italy; merely, it is said, because he recommended the works of Galileo, Grotius, and Newton. His friends, however, powerfully supported him, and by the influence of Galiani, the director of the Neapolitan universities, he was appointed to the office of professor of ethics, which afforded him ample field for combating the ignorance and prejudices of the schools. The principle of his system was, that the happiness of man is the only object of the philosophical doctrine of morals, and he deduced his duties from analytical considerations. He interwove in his lectures the history of the human passions,

and enlivened them by a boldness and spirit peculiarly his own. He composed a new system of logic, which he dictated in his lectures, and which was afterwards published in 1745, under the title of "Elementorum Artis Logico-criticæ, Libri quinque." This might be considered as an introduction to his metaphysics, the first part of which had been published before this period, but the second and third parts and their appearance in the years 1747—1751. In 1743, he put up for the vacant chair of theology, but, as this was always connected with the episcopal dignity, he was immediately regarded as unfit for so high an office in the church, on account of his heretical notions. His enemies now discovered the most serious and alarming doctrines, in the published and unpublished pieces of which he had been the author. He was obliged therefore to renounce the science of theology, and to suppress some valuable works on this subject. He now turned his attention to political economy, and in a few years he not only made himself master of every thing deserving of notice on this science, but struck out some new lights. He published, in 1753, the first fruits of his researches, entitled "Essays on Agriculture, with considerations on the true Object of the sciences." He was now, at the instance of his friend Intieri, made professor of political economy, with a considerable salary. The office had been instituted solely for him, and it was agreed that the lectures should always be delivered in the Italian language, a circumstance, at that time, wholly unknown at Naples. His lecture room was crowded, and in a short space of time he was obliged to take a still larger place for the display of his talents, which also was insufficient to contain all who came to be benefited by his instructions. His chief and avowed object was, while he taught the principles of political economy, to inspire the Neapolitan youth with the social and civil virtues, and above all with a public spirit of patriotism, without which no nation, he contended, could attain to that height of prosperity of which it is susceptible. He caused to be translated Carey's History of the English Trade into the Italian, and then published it with useful notes. After this he pointed out in a short treatise the causes of the decline and neglect of agriculture in the kingdom of Naples. In 1765 he published another work, in which he examined the question, "Why countries, the most fruitful by nature, are often exposed to the miseries of scarcity." He was author of many other works, but his master-piece was the "Italian System of Morality," of which the first part was published in the year 1767, under the title of "Dicosyna." His health now gave way, and he was unable to prosecute his studies, and, in 1768, he was obliged to discontinue his lectures, and in the following year he expired, in the fifty-seventh year of his age. He had attained, as a man of science, a very high reputation, and his moral character was in every respect worthy of a true philosopher. He possessed a most ardent love of truth, and a desire to extend its dominion, in which he was aware the happiness of his fellow-creatures was deeply concerned. "He was," says his biographer, "an irreconcilable enemy to injustice and deception; his countenance displayed cheerfulness, tranquillity, and invincible courage. He was too proud to stoop to flattery in order to become rich, and was contented with a very moderate income." He died poor, and would have been in distressed circumstances in the latter years of his life, had not the sovereign supported him unsolicited. He was held in high estimation by pope Benedict XIV. and many of the cardinals; and by inspiring in the breasts of his pupils an ardent love of their country, with a well regulated zeal for

its best interests, he was the means of introducing them to offices of distinction, which they filled with honour to themselves, and high advantage to the best interests of the state. *Gen. Biog.*

**GENOUILLAT**, in *Geography*, a town of France, in the department of the Creuse; nine miles W. of Bouffac.

**GENOUILLE**, a town of France, in the department of the Charente; 10 miles W. of Jean d'Angely.

**GENOWI**, a town of Africa; six miles N. of Senmar.

**GENSAC**, a town of France, in the department of the Gironde; nine miles S. E. of Libourne.

**GENS D'ARMES**. See **GENDARMES**.

**GENSERIC**, in *Biography*, a famous king of the Vandals, succeeded his brother Gonderic in his Spanish dominions in the year 428. He had already signalized his courage and skill in war, and was enured to toil and hardships of every kind. Soon after his succession he invaded Africa, at the head of 50,000 men, and made himself master of the greater part of the country on the sea-coast. The persecution of the Donatists was an event highly favourable to the designs of Genseric. Seventeen years before he had landed in Africa, a public conference was held at Carthage by order of the magistrate, which ended in a most severe persecution. Under these circumstances, Genseric, himself a Christian, but an enemy of the orthodox faith, avowed himself the vindicator of the rights of the Donatists, who, in their turn, looked up to him as their deliverer, from whom they might reasonably expect the repeal of the odious and oppressive edicts of the Roman emperors. Genseric obtained the most signal victories over his enemies, but notwithstanding his success, he agreed to a treaty with the emperor Valentinian, whom he consented to leave in possession of the three Mauritaniae. He delivered to the Romans his own son Hunneric, as a hostage for the observance of his treaty; but they, trusting to his good faith, sent back the youth. Genseric abused his indulgence by seizing upon the city of Carthage in 439, at a time when the empire was engaged in a war with the Goths. From Carthage he sailed with a large fleet, and landed in Sicily. He ravaged almost the whole of that island, and made a vast booty, but was unable to effect the conquest of Palermo. The object of this prince was to render himself formidable by sea; and he succeeded so completely, that the eastern and western emperors, Theodosius and Valentinian, thought it necessary to join against him. They fitted out a powerful fleet, with a large army, destined for the recovery of Africa; but Genseric deluded them by proposals of accommodation, and the irritation of the Huns obliged Theodosius to recall his forces. When Maximus ascended the western throne, he compelled Eudoxia, the widow of Valentinian III., to marry him; she in a short time secretly applied for the dangerous aid of Genseric to free her from his tyranny. He, seizing the occasion, appeared at the mouth of the Tiber with a numerous fleet; and in the contest Maximus was slain, which afforded Genseric an opportunity of marching to the gates of Rome, where he was admitted almost without opposition. For fourteen days the city was abandoned to all the licentiousness of a barbarian soldiery; and on his return he carried away an immense quantity of treasure, besides multitudes of captives, chiefly of the female sex, among whom were the empress and her two daughters, one of whom he married to his son Hunneric; and after the lapse of several years, he restored the other and her mother to their native place. Genseric continued to annex to his

dominion the remaining Roman provinces in Africa; and then sent a fleet, consisting of sixty galleys, into the Italian sea, which was destroyed. But the loss of his ships did not prevent him from renewing his ravages on the coast of Italy, till his power received a severe check from the emperor Majorian, who now began to act on the offensive, and formed the spirited resolution of attacking the Vandals, in Africa. He fitted out a formidable fleet for the purpose, which obliged Genseric to sue for peace. His suit being rejected, he sent out a squadron, which coming unawares upon the Roman navy, in the bay of Carthage, almost destroyed it. Peace was now made between the two warriors, the terms of which were observed till the death of Majorian, in 461. After this, Genseric prepared to repeat his aggressions, and he again ravaged the coasts of Italy and Sicily, and even took possession of Sardinia. He extended his hostilities to all parts of the Mediterranean, and frequently indulged in acts of the most brutal atrocity. At one time he is reported to have massacred five hundred noble citizens of Zacynthus, and to have thrown their dead bodies into the sea. Leo, the eastern emperor, resolved to make an effort to free his dominions from this terrible scourge, and made vast preparations for the invasion of Africa. The conduct of the expedition was given to Basiliscus, who might have extinguished for ever the kingdom of the Vandals, had he seized the moment of consternation, and boldly advanced to the capital. Genseric beheld the danger with firmness, and eluded it with his veteran dexterity. He professed himself ready to submit his person and dominions to the will of the emperor; but requested a truce of five days to regulate the terms of his submission. Basiliscus consented to the fatal truce; and during the short interval, the wind became favourable to the designs of Genseric. He manned his largest ships of war with the bravest of the Vandals and Moors; and they towed after them many large barks filled with combustible materials. In the obscurity of the night these destructive vessels were impelled against the unguarded and unsuspecting fleet of the Romans, who were soon awakened to a sense of their instant danger. "Their close and crowded order," says the historian, "assisted the progress of the fire, which was communicated with rapid and irresistible violence; and the noise of the wind, the crackling of the flames, the dissonant cries of the soldiers and mariners, who could neither command, nor obey, increased the horror of the nocturnal tumult." Basiliscus returned ingloriously to Constantinople with the remainder of his shattered fleet; and thus the fruits of all this mighty effort were lost. Genseric put to sea, recovered Sardinia, which had been taken from him, reduced Sicily and all the islands between Italy and Africa, and became a greater terror to the empire than ever. In 476, he made a peace with Odoacer, king of Italy, to whom he restored Sicily, but on condition of receiving tribute. The emperor Zeno likewise relinquished to him and his successors all claims to the African provinces. Genseric died in the year 477. In his early youth he had renounced the orthodox communion; and as an apostate he could neither grant nor expect a sincere forgiveness. He was exasperated to find that the Africans, who had fled before him in the field, still presumed to dispute his will in synods and churches; and his ferocious mind was incapable of fear, or of compassion. His catholic subjects he oppressed with intolerant laws, and arbitrary punishments. The language of Genseric was furious and formidable; the knowledge of his intentions might justify the most unfavourable interpretation of his actions; and the

the Arians were reproached with the frequent executions which stained the palace, and the dominions of the tyrant, Gibbon. Univer. Hist.

**GENTIAH**, in *Geography*, a town of Asia, in the country of Affam; 370 miles E. of Patna. N. lat. 25 10'. E. long. 92° 10'.

**GENTIAN**, in *Gardening*, the common name of a large hardy perennial herbaceous plant, which has a root that affords an extremely strong bitter. See **GENTIANA**.

**GENTIANA**, in *Botany*, *gentianon* of the Greeks, named after Gentius, a king of Illyria, who is said to have discovered it, or at least to have first experienced its virtues as a cure for the plague, which infected his army. Gentian, or Fell-wort. The latter name, we presume, is derived from *fel*, gall, alluding to its extreme bitterness, and not from fell, the north-country appellation of a mountain. It therefore ought to be, as Gerard writes it, Fel-wort.—Linn. Gen. 126. Schreb. 175. Willd. Sp. Pl. v. 1. 1331. Mart. Mill. Dict. v. 2. Sm. Fl. Brit. 284. Juss. 141. Lamarck Illustr. t. 109. Gærtn. t. 114. Class and order, *Pentandria Digynia*. (*Monogynia*; Lamarck.) Nat. Ord. *Rotacea*, Linn. *Gentiane*, Juss.

Gen. Ch. *Cor.* Perianth inferior, in five deep, oblong, acute, permanent segments. *Cor.* of one petal, tubular in the lower part, without pores; in the upper five-cleft, regular, various in form and direction, withering. *Stam.* Filaments five, awl-shaped, shorter than the corolla, connected with its tube; anthers oblong, simple, sometimes united into a cylinder. *Pist.* Germen superior, ovate or oblong, cylindrical, as long as the stamens; styles none; stigmas two, ovate, recurved. *Peric.* Capsule oblong, roundish, pointed, slightly cloven at the summit, of one cell and two concave inflexed valves. *Seeds* numerous, small, flattish. *Receptacles* two, affixed longitudinally to each valve.

Ess. Ch. Corolla tubular at the base, destitute of nectariferous pores. Capsule superior, of one cell and two valves, with many seeds.

Obs. The figure of the fruit is constant, but the corolla is very different in different species, being either wheel-shaped, bell-shaped, or funnel-shaped. In some there are small intermediate segments, in others a fringe to the corolla; in some it is plaited, in others plain. A few species have a four-cleft tetrandrous flower; but the remark in Linn. Gen. 176, that there is a species with three additional parts of the flower, alludes to *Chlora*, once reckoned a *Gentiana*. Linnæus has erased the line from his own copy, and his editors might easily have made the same correction. *G. lutea*, and some others, however, have frequently a superabundance of divisions and stamens in a few of their blossoms.—The upper part of the germen so much resembles a style, that Lamarck has perhaps offered no great violence to nature, or the Linnæan system, in considering it such.

This very noble and beautiful genus of herbaceous plants is chiefly of alpine origin, where the lovely blue flowers of many species enamel the turf in a most splendid manner. Most are perennial, some few annual. All are intensely bitter in flavour, especially the roots of the larger perennial kinds, *G. lutea*, Woodv. Med. Bot. t. 156, which is the officinal Gentian; *purpurea*, Fl. Dan. t. 50, which is the Curfuta of the Edinburgh Pharmacopœia; *pannonica*, Jacq. Austr. t. 136; *punctata*, ibid. app. t. 28; and *campanulata*, t. 29. These are scarcely even seen in gardens, except the first, which is not easily established; but few plants are more

flatly and ornamental. The North American *G. fistularia*, Curt. Mag. t. 1039; and the alpine *asclepiadea*, t. 1078, are both very handsome, and we have found the latter thrive for many years in a bed of peat, earth and loam, as well as on its native mountains. See Curt. Mag.—*G. aculeata*, Curt. Mag. t. 52. Engl. Bot. t. 1594, is one of the most common in gardens, but requires rather a pure air. *G. verna*, nearly allied to it in habit and beauty, see Engl. Bot. t. 493, though wild in the mountainous parts of Dr. Rhine, and abundant on the Swiss and Italian Alps, will scarcely live in a garden at all. *G. Pneumoniæ*, ibid. t. 20, found on turfy heaths in many places, is likewise very handsome, and rather impatient of culture. We have never seen the culture of the annual kinds attempted; such are *nitida*, Engl. Bot. t. 896; *Amarella*, t. 236; and *campanulata*, t. 237.

Linnaeus was by no means well acquainted with the different species of this genus, having never visited the more southern alps of Europe, where alone they are to be studied to advantage. Hence his *verna* and *bavaria* are one species, and he confounded with *lutea*, which he seems never to have seen, or at least to have afterwards forgotten, the *G. floribus terminantibus diaphanis*, Gmel. Sib. v. 2. 106; *G. chido*, Pallas. Ross. t. 95. Hence the erroneous remark under *lutea*, "petala punctis spartis creberrimis, flava." There is some doubt whether *G. fistularia*, Sims in Curt. Mag. t. 1229, be the same as Pallas's t. 92. f. 3. In the former the flower appears to us very rarely, if ever, with more than five divisions, nor do the habits of the two figures accord. Willdenow has fifty-six species of *Gentiana*, some of which among the annual kinds we are not able to determine to our satisfaction. He quotes a monograph by Froelich, which appears to have great merit, but which has not come to our hands.—Six species only of this genus are wild in Britain, the *Chlora* and *Chironia* being now, with the greatest possible propriety, separated from it.

**GENTIANA**, in *Gardening*, comprises plants of the hardy, herbaceous, perennial, showery kind; of which the species cultivated are the yellow gentian (*G. lutea*); spotted flowered gentian (*G. punctata*); swallow-wort-leaved gentian (*G. asclepiadea*); and the dwarf gentian, or gentianella.

*Method of Culture.*—In the three first sorts it is easily effected by sowing the seeds in pots soon after it is ripe, as when kept till spring it will not succeed: the pots should be placed in a shady situation, and kept clean from weeds. Some advise their being sown where they are to remain. But the first is probably the best method. In the spring the plants appear, when they must be duly watered in dry weather, and kept clean from weeds till the following autumn; then be carefully shaken out of the pots, so as not to break or injure their roots; and a shady border of loamy earth should be well dug and prepared to receive them, into which they should be put at about six inches distance each way, the tops of the roots being kept a little below the surface of the ground, and the earth pressed close to the roots. If the following spring prove dry, they should be duly watered to forward their growth. The plants may remain here two years, by which time they will be fit to transplant where they are designed to grow, removing them in the autumn as soon as their leaves decay; great care being taken in digging them up not to cut or break their roots, as that greatly weakens them. They require afterwards no other culture but to dig the ground about them early in the spring before they begin to flower, and in the summer to keep them clean from weeds. The roots continue many years, but the stalks decay every autumn;

the same roots not flowering two years together, or seldom oftener than every third. When they flower strong, they have, however, a fine appearance among other similar plants.

In respect to the last sort it is mostly propagated by offsets or parting the roots, and planting them where they are to remain in the early autumn; but in order to have the plants flower well, they should not be often transplanted or parted. And they are also capable of being raised from seeds managed in the same way as in the first kinds.

All these plants succeed the most perfectly in moist loamy soils, where there is a degree of shade afforded.

They are useful as ornamental plants, for the clumps, borders, and quarters of pleasure-grounds; those of low growth being planted towards the fronts, and the latter kinds more backward in them.

**GENTIANA**, *Gentian*, in the *Materia Medica*. The root, which is the only medicinal part of the plant, has little or no smell, but to the taste it manifests great bitterness; a quality which is extracted by aqueous, spirituous, and vinous menstrua, though not in so great a degree by water as by spirit; and the extract of this root, prepared from the watery infusion, is less bitter than that made from the spirituous tincture. Gentian is the principal bitter now employed by physicians; and as the intense bitters are generally admitted to be not only tonic and stomachic, but also antihelmintic, antiseptic, emmenagogue, antiarthritic, and febrifuge, this root has a better claim to the possession of these powers than most of this kind. Many dyspeptic complaints, though arising from debility of the stomach, are more effectually relieved by bitters than by Peruvian bark; and hence may be inferred their superior tonic power on the organs of digestion; but we are told by Dr. Cullen (*Mat. Med.* vol. ii.) that the gentian, joined with equal parts of tormentil or galls, constantly succeeded in curing intermittents, if given in sufficient quantity. As a simple bitter the gentian is rendered more grateful to the stomach by the addition of an aromatic; and for this purpose orange-peel is commonly employed. The official preparations of this root are, the "infusum gentianæ compositum," and "tinctura gentianæ composita," (*Ph. Lond.*) and the "infusum amarum," "vinum amarum," "tinctura amara," five "elixir stomachicum" (*Ph. Ed.*) which latter is said by Dr. Cullen to be the same as Stoughton's elixir, (see *Stomachic Elixir*) and by both Pharmacopœias the extract is directed. The "compound infusion" is prepared by taking gentian root sliced and orange-peel dried, of each a dram, of fresh lemon-peel two drams, and boiling water twelve ounces; and macerating for an hour in a covered vessel, and then straining the liquor. For the "tincture," take of gentian root dried, two ounces, orange-peel dried, an ounce, cardamom seed bruised, half an ounce, and proof spirit two pints; macerate for fourteen days, and strain. For the "extract," take of gentian root sliced, a pound, and boiling water, a gallon; macerate for twenty-four hours, then boil down to four pints; strain the hot liquor, and evaporate it to a proper consistence. The extracts are made into pills, with or without aromatic additions. Wines and malt liquors are likewise impregnated with the virtues of this root in different proportions. An ounce of the gentian root, the same quantity of fresh lemon-peel, and two drams of long pepper, communicate by maceration, without heat, a grateful warmth and bitterness to a quart of mountain. There is an Indian gentian brought from America by the Portuguese, of a pale yellowish colour, jointed and marked with knots and circles like ipecacahuna,

more intensely bitter than any of the official bitter drugs. This root is greatly commended in obdurate intermittents, and other disorders; a scruple is said to be more effectual than repeated half drams of bark.

There was a mixture of henbane root brought over some years ago with the common gentian, which occasioned violent disorders, and in some instances proved fatal.

This root is of a paler colour than gentian, and its longitudinal wrinkles finer and closer; the poisonous root, when cut, appears white, without any degree of the yellow hue, which is deep in gentian; and its taste is not bitter, but mucilaginous. *Phil. Trans.* vol. xlv. p. 240. *Lewis's Mat. Med.* *Woodville's Mat. Med.*

**GENTIAN Water.** See **WATER**.

**GENTIANE**, the forty-sixth natural order of plants in Jussieu's system, or the thirteenth of his eighth class, so named from the principal genus contained in it. The character of this eighth class is *Cotyledons* two. *Flowers* of one petal, inserted below the germen, regular or irregular. *Calyx* of one leaf. *Stamens* of a definite number, inserted into the corolla, and usually alternate with its divisions, when they agree in number. *Germen* superior, simple; style one, (sometimes none in the *Apocineæ*, with a double germen); stigma simple or divided. *Fruit* superior, consisting either of naked seeds, or for the most part enclosed, either in a pulpy or a capsular seed-vessel, of one or many cells.

The characters of the *Gentiane* are these. *Calyx* divided, permanent. *Corolla* regular, often withering before it falls, with a limb equally divided, whose segments agree in number with those of the calyx and are most commonly five, sometimes oblique. *Stamens* as many, inserted into the middle or upper part of the corolla; anthers incumbent. *Style* one, or rarely, by splitting, double; stigma simple or lobed. *Capsule* simple or of two parts, of two valves, and one or two cells, the valves inflexed at the margin, involute where there is but one cell, flat and constituting the partition where there are two. *Seeds* numerous, small, inserted into a marginal receptacle connected with the valves. *Stem* herbaceous, rarely somewhat shrubby. *Leaves* opposite, mostly undivided and sessile; floral ones occasionally smaller, resembling bractæas, the flowers in such case becoming, as it were, doubly bracteated.—The first section has a simple capsule, of one cell, and contains *Gentiana*, *Lita* of Schreber (*Polibria* of Aublet), *Pierium* of Schreber (*Cantouba* of Aublet), *Swerbia* and *Cbleca*: the second, with a simple capsule of two cells, contains *Evacum*, *Lisiantibus*, *Nyrnecia* of Schreber (*Tachia* of Aublet), *Chironia* and *Nigrina*; the third with a didymous or two-lobed capsule of two cells, contains only *Spigelia* and *Ophiorrhiza*. In a fourth section stands as a kind to this order, by itself, *Nicandra* of Schreber (*Potalia* of Aublet.) The plants of this natural order are chiefly remarkable for their intense bitterness, and consequent stomachic virtues. Their flowers are usually beautiful, either blue, yellow or red, scarcely white, except by occasional variation of the blue or red.

**GENTIANELLA**, in *Gardening*, the common name of the dwarf gentian, and which properly signifies the *little gentian*, which has a broad leaf and large flower. See **GENTIANA**.

**GENTILE**, **GENTILIS**, a pagan, or person who adores false gods. The Hebrews applied the name גֵּתִילִים, *gentes, nations*, to all the people of the earth who were not Israelites or Hebrews.

Some will have it that the gentiles were thus called in contradistinction to the Jews, because the latter had a positive law



law to observe in matters of religion, whereas the gentiles had only the natural law : hence they are called " gentiles, quia sunt uti geniti fuerunt," because they remain as in a state of nature.

The Jews apply the denomination gentiles much as the Christians do that of infidels. St. Paul is called the *doctor*, or *apostle of the gentiles*, which appellation he first gave himself, Rom. xi. 13. " As I am the apostle of the gentiles, I magnify mine office."

The calling of the gentiles to Christianity had been predicted in the Old Testament, as it was accomplished in the New. See Psal. ii. 8. Isa. ii. Joel ii. 29. Matth. viii. 11. xii. 18. Acts, xi. 18. xiii. 47, 48. xxviii. 28. Rom. i. 5. iii. 29. xi. 12, 13. 25. Eph. ii. 11. Rev. xi. 2. xxii. 2.

Some account may not be improperly given in this place of the state of Christianity both before and after the time of Constantine's conversion. The opposition of the Jews to its reception and prevalence appears in the Acts of Apostles, and the epistles of the New Testament. Our present object is to consider, first, the state of its progress in gentile countries, and under heathen emperors, from about the middle of the first century, when it began to be preached among the gentiles, and to make some progress among them, to the period when Constantine embraced the Christian religion ; and, secondly, its state under the Christian emperors, and their treatment by the gentiles. In the former period, we find from St. Luke's account in the Acts of the Apostles (ch. xiv. 19, 20 ch. xvi. 19—24.) that St. Paul met with some difficulties in preaching the gospel in gentile cities ; but no imperial edicts were issued against the Christians, before that of Nero in the year of Christ 64 or 65, at which time the two apostles, Peter and Paul, were put to death. For an account of the *ten* persecutions, as they have been usually reckoned, which the Christians suffered under heathen emperors, we refer to the article PERSECUTION. These persecutions were ordered by edicts of emperors, beginning with Nero's and ending with Dioclesian's. During the whole of this period Christianity had been in a state of persecution. At the commencement of the second period, in 313, Constantine and Licinius issued a law or edict, giving liberty to all men, Christians and others, to follow that way of worship which should be most agreeable to them. However, it appears that Constantine did not strictly observe his own edict ; for, according to the utmost of his power, by various methods, by laws, institutions, rewards and encouragements, he endeavoured to root out the ancient religion, and to promote the Christian doctrine. Conceiving that neither he nor the Roman empire could be safe, as long as the ancient superstition subsisted, he openly opposed the gods of the gentiles, and their worship, as dangerous to the public welfare. After the death of Constantine in the year 337, the whole empire was divided between his sons. Constantians, with whom his brother Constantius concurred, passed a law in 341, ordering superstition to cease, and the madness of sacrificing to be abolished ; under the menace of a proper and convenient punishment. This law was followed by another law of Constantians in the next year, 342, forbidding the demolition of temples, which stood without the walls of the city of Rome. Another law, which was the first of Constantians, and passed, as it has been supposed, in the year 353, ordained that in all places, and in all cities, temples should be immediately shut up, and that the people should abstain from sacrifices, under the penalty of death and the confiscation of their estates to the treasury. The second law of Constantians, in the same year, prohibited nocturnal sacrifices ; and a law, published by the same emperor in the year 356, appointed capital punishment to such as were convicted of per-

forming sacrifices or worshipping images. Three other laws of Constantius were also published in the year 356 or 357, with the penalty of death against all who consulted any of the masters of divination, who are enumerated under their several titles of haruspices, mathematicians, Chaldeans, harioli, augurs, vates, and magicians. The emperor Julian is well known for his zeal in favour of gentilism, and for his injurious treatment of the Christians. At his accession we may reasonably suppose, that all the laws of preceding Christian emperors against gentilism and its rites, were abrogated, and that it was actually established by imperial edicts ; whilst Christians were deprived of magistracy, and all honours and dignities, as well as also of equal rights of citizenship. The emperors Jovian, Valentinian, and Valens were Christians ; and they encouraged their subjects in the profession of Christianity, and protected them in the enjoyment of the privileges conferred upon them by Constantine : but it does not appear that during this period any new laws were issued against gentiles and their sacrifices. Jovian, indeed, published a law of universal toleration ; and Valentinian was remarkable for the moderation of his government. In the year 381 was issued a law of Theodosius, with the joint authority of Gratian, and the younger Valentinian, enacting, that apostates from Christianity to paganism should lose the power of making a will. This law was afterwards ratified, and followed by other laws of Theodosius the Great, Valentinian the Younger, Arcadius, Honorius, and Theodosius II., with the addition of other clauses. In the same year, 381, and by the same authority, was enacted a law, forbidding all sacrifices in the way of divination, either by day or by night, in the temples or elsewhere, upon the pain of proscription. By another law of Theodosius, in the following year, the magnificent temple in the province of Osrhoenè, or Edeffa, was allowed to be open, and to be frequented, provided no sacrifices were performed there. In 385 Theodosius published another law, forbidding sacrifices, especially such as were made in the way of divination, and for discovering futurities, upon pain of death. In 391 was published a law of Theodosius, in which all sacrifices of innocent victims, and access to the temples, and the worship of senseless images, are prohibited. This law was particularly designed for Rome and Italy ; and in the same year a similar law was published for Egypt, forbidding sacrifices and access to temples. In 392 was published a severe law of Theodosius, forbidding to men of all ranks every kind of heathenish worship ; and in 399 Arcadius published a law for destroying temples in country places. Several other laws were published by Theodosius the younger against all Pagan oblations and sacrifices, and ordering the destruction of chapels, temples, and consecrated places. Nevertheless gentilism still subsisted. Upon the whole it may be observed, that the period of 20 or 25 years, from the death of Constantius to the accession of Theodosius, or thereabout, is remarkable for the mildness with which the gentiles were treated, and the few laws that were issued against them ; and these laws against gentilism were not rigorously executed ; but many gentiles were admitted into civil offices of great trust and profit ; and many instances occur, which evince the moderation of Christian magistrates under Christian emperors ; and, indeed, it is true both with respect to Christians and gentiles, that all wise and understanding men of every sect and religion, recommended moderation, and concurred in condemning force and compulsion in religious matters. See more on this subject in Lardner's Works, vol. ix. 98—218.

GENTILE, *Gentilis*, in the Roman Law and History, a name which sometimes expresses those whom the Romans otherwise call Barbarians ; whether they were allies of Rome,

or not. In which sense the word occurs in Ammianus, Aufonius, and the Notitia Imperii.

GENTILIS was also used, in a more peculiar sense, for all strangers, or foreigners, not subject to the Roman empire; as we see in the Theodosian Code, in the title "De Nuptiis Gentilium:" where the word gentiles stands opposed to *provinciales*, or the inhabitants of the provinces of the empire.

The word is likewise used, in this sense, in the Greek; but it was not introduced either into that, or the Latin tongue, till after Christianity was established; it being taken from scripture. See ESQUIRE and GENTLEMAN.

GENTILESCHI, ORAZIO, in *Biography*, a painter, born at Pisa in 1563. His parental name was Lomi, but he chose to adopt that of his maternal uncle. He first learnt the art under his half brother Aurelio Lomi, but afterwards studied at Rome. After distinguishing himself at Florence, Turin, and Genoa, he passed to Savoy and France, and thence was invited into England by Charles I. who gave him lodgings, and a considerable salary; and employed him in painting ceilings, &c. at Greenwich. He was also employed by Villiers, duke of Buckingham, at York House, on a picture of himself and his family. After residing here about twelve years, he died at the age of 84 in 1647. The clearness and brilliancy of the style in which he painted may be seen to the greatest perfection in a picture at Hampton Court of Joseph and Potiphar's wife. He made king Charles a present of a large book of drawings, and was deservedly respected and admired for his abilities.

GENTILE CHI, ARTEMISIA, daughter of Orazio, and his pupil, who obtained almost as much skill and credit as her father. She followed him to England, where she practised in portraits with great success. She also exercised her talents in historical painting, and has left many highly creditable works behind her.

Her picture of Judith with the head of Holofernes at St. James's palace, is in the same style of design as her father's, but though very skillful, is not so bright, or so finely wrought as his pictures usually are. After the death of Orazio, she retired to Naples, where Graham says she became as famous for her amours as for her skill in painting. She died in 1642.

GENTILI, ALBERICO, was born in 1550, at Castel S. Genesio, in the marche of Ancona. He studied the law, and took his degrees at the university of Perugia, and was prætor at Ascoli, when his father, becoming a convert to the reformed religion, determined to quit Italy, and take with him his sons Alberico and Scipio. The former, the subject of this article, came to England, and in 1582 was chosen professor of jurisprudence in the university of Oxford, which he held with much reputation till his death in 1608. He was a man of great learning, and published various works. One, entitled "Six Dialogues on the Interpreters of Law," he dedicated to his patron the earl of Leicester. He is author of three books "De Jure belli," which are highly applauded by Grotius: of three others "De Legationibus," and several tracts relative to antiquities. His "Lectiones Virgilianæ" prove that he had cultivated polite literature very successfully. Bayle.

GENTILI, SCIPIO, brother of the preceding, was born in 1563, and, while a child, was sent to Tubingen for his education. Here he distinguished himself in the study of the classics and jurisprudence, which he afterwards pursued with increasing success at the universities of Wittemberg and Leyden. In 1589 he took his degree of doctor at Basil, and then went to Wittemberg as a public expounder of the law. Shortly after he removed to Altdorf, and became prin-

cipal professor of law. His fame extended very far, and he received invitations to settle at several universities, and one from pope Clement VIII. to settle at Bologna, which he declined. He died at Altdorf in 1616, leaving behind him many works as monuments of his deep erudition. These were afterwards collected and printed in 8 vols. 4to. ; they are chiefly on subjects connected with jurisprudence. As a teacher, his manner was clear and interesting. He was a good Latin poet, and translated several of the Psalms, and the first two cantos of Tasso's Jerusalem. Bayle.

GENTILIS, GENTILIS, was born at Foligni, in Italy, about the year 1230. He studied medicine under the tuition of Thaddeus of Florence, with great diligence and reputation, so that on his return to his native place he was regarded by his fellow-citizens as the first physician of the time; and his fame soon extended through Italy. He was also esteemed one of the best commentators upon Avicenna, whose writings were then held in high veneration in most of the universities of Europe. Gentilis died at Bologna about the year 1310, and left several treatises, which were collected and published at Venice, in four volumes folio, in 1484, 1486, and 1492. The following works were likewise printed separately: 1. "Expositiones in textu Avicennæ."—2. "De Febribus," Venice, 1484.—3. "Expositio cum Commento Aegidii Monachi Benedictini Libri de Judiciis Urimurum, et Libri de Pulsibus." Ibid. 1494.—4. "Consilia peregrina ad quævis morborum totius corporis genera," with some other tracts, Venice, 1503.—5. "Quæstiones et Tractatus extravagantes." Ibid. 1520.—6. "De Lepra Tractatus." Ibid. 1536, with the surgery of Dinus de Garbo.—7. "De proportionibus Medicinarum," with different dissertations upon the subject of doses of medicines by the most celebrated physicians, Padua 1556, &c. See Eloy. Dict. Hist.—Several other individuals of the family of Gentilis were distinguished for their knowledge of medicine and the sciences.

GENTILIS, JOHN-VALENTINE, was born at Cosenza in Calabria. Educated in the principles of the Roman Catholic religion, and becoming a convert to the principles of the Reformation, he was obliged to quit his native country, and take refuge in Geneva, where several Italian families had already formed a congregation. His enquiries did not stop by the open renunciation of papal errors; he became dissatisfied with the orthodox doctrine of the Trinity. He was required to subscribe to the articles of faith which the persecutor John Calvin had established against heresy, to which a promise was annexed, never to do any thing, directly or indirectly, that should controvert the doctrine of the Trinity. At first Gentilis refused the test, but was afterwards prevailed on to comply, dreading probably, in case of his resistance, a similar treatment to that which Servetus had experienced. What his hand had signed, and his tongue confessed, his heart abhorred, and in private he did not scruple to avow the truth, which coming to the ears of the magistrates, they committed him to prison. From the dungeon he attempted to expostulate with his persecutors, shewing the inoffensiveness of his opinions, but their hearts were steeled against the supplications of a heretic, till he offered to abjure his errors, consented to throw his writings into the fire, and take an oath not to quit Geneva without leave of the magistrates. Being thus, in a measure, freed from suspicion, and feeling conscious that he would be justified in breaking an oath which had been extorted by terror, he withdrew from the city, but finding no place of safety he returned, was again imprisoned, but in a short time liberated. From this period he seems to have wandered from place to place, and we find him at Lyons, in various parts of Poland and Germany, in Savoy, and at last

at Bern, where he was accused of heresy. He underwent a long and tedious trial, and being convicted of obstinately oppugning the mystery of the Trinity, he was sentenced to lose his head. This sentence was carried into execution, but death, which, at a greater distance, seemed so formidable to him, was now disarmed of his terrors, and by a manly fortitude he was enabled to triumph over his enemies, who expected that his mind was ill-adapted to so trying a scene; his last moments were probably the happiest of his life. He died exulting that he was thought worthy of suffering for the cause of truth, and that he was admitted to seal, with his blood, the doctrine of the supremacy and unrivalled glory of the Father. *Moreri. Bayle.*

**GENTILITIA, SACRA**, among the Romans. See **SACRA**.

**GENTILITIVUS**, an epithet used by some authors to express diseases propagated from father to son, and running through whole families; such as are more usually called hereditary disorders. Such are the gout very frequently, and often many others.

**GENTILLET, VALENTINE**, in *Biography*, a native of Dauphiné, who flourished in the sixteenth century. He had in early life studied jurisprudence, and was a civilian by profession. He was an advocate in the parliament of Toulouse, and afterwards a syndic of the republic of Geneva, and at one period of his life he was president of the parliament of Grenoble. He became distinguished by his writings against popery, but by the edicts published in France against those of the reformed religion, he was driven into exile. His principal works are, "An Apology for the Protestants," which went through several editions in the French, and was afterwards translated into Latin and enlarged, under the title of "Apologetica pro Christianis Gallis Religionis, Evangelicæ seu Reformatæ, qua docetur hujus Religionis fundamenta in Sacra Scriptura jacta esse;" and "Le Bureau du Concile de Trente, &c." This was printed in French in 1586, and in the same year a Latin translation of it was published, which was frequently reprinted at different places. Its design is to shew that many of the decrees of that council were contrary to the ancient councils and canons. He was author also of "Anti-machiavel," and the "Anti-focinus." *Bayle.*

**GENTIMANETOUR**, in *Geography*, a town of Hindoostan, in the Carnatic; 30 miles W. of Cuddalore.

**GENTIOUX et PALLIER**, a town of France, in the department of the Creuse, and chief place of a canton in the district of Aubusson; 9 miles S.W. of Felletin. The place contains 907, and the canton 6,507 inhabitants, on a territory of 327½ kilometres, in 8 communes.

**GENTLE PIT ORE**, in *Minerology*, a name given by our miners in Sufsex, to a kind of iron ore found in considerable plenty in that county, and very readily running in the fire, though not over rich in metal. It is a strong substance, and lies in several parts of that county in form of a moderate; thick stratum. It is of a dusky brown colour, and in some places much paler than in others. It has always a great number of glittering spangles in it, and very often contains fossile shells, and other extraneous substances in it.

**GENTLEMAN**, a person of good family, or descended of a family which has long borne arms, the grant of which adds gentility to a man's family.

The word is formed of the French *gentilhomme*, or rather of *gentil, fine, fashionable, or becoming*; and the Saxon *man, q. d. honestus, or honesto loco natus*. The same signification has the Italian *gentiluomo*, and the Spanish *hidalgos, or hijos-dalgo*, that is, the son of somebody, or of a person of note. If we go farther back, we shall find gentleman originally

derived from the Latin *gentilis homo*, which was used among the Romans for a race of noble persons, of the same name, born of free or ingenious parents, and whose ancestors had never been slaves, or put to death by law. Thus Cicero, in his *Topics*, "gentilis sunt, qui inter se eodem sunt nomine ab ingenio oriendi, quorum majorum nemo servitutem servivit, qui capiti non sunt diadanti, &c." Some hold that it was formed from *gentilis, q. d. pagan*; and that the ancient Franks, who conquered Gaul, which was then converted to Christianity, were called gentiles by the natives, as being yet heathens. Others relate that towards the declension of the Roman empire, as recorded by Ammianus Marcellinus, there were two companies of brave soldiers; the one called *gentilium*, and the other *scutariorum*; and that it was hence we derived the names gentleman and esquire. This sentiment is confirmed by Pasquier, who supposes the appellation *gentiles* and *esquiers* to have been transmitted to us from the Roman soldiery; it being to the *gentiles* and *scutarii*, who were the bravest of the soldiery, that the principal benefices and portions of lands were assigned. (See **BENEFICE**.) The Gauls observing, that during the empire of the Romans, the *scutarii* and *gentiles* had the best tenements, or appointments of all the soldiers on the frontiers of the provinces, became insensibly accustomed to apply the same names, *gentilhommes*, and *esquiers*, to such as they found their kings gave the best provisions or appointments to. *Pasq. Rech. lib. ii. cap. 15.*

In strictness, Chamberlayne observes, a gentleman is one whose ancestors have been freemen, and have owed obedience to none but their prince: on which footing, no man can be a gentleman who is not born so.

Among us, the term gentleman is applicable to all above yeomen; so that noblemen may be properly called gentlemen.

In our statutes, *gentilis homo* was adjudged a good addition for a gentleman. 27 Edw. III. The addition of knight is very ancient: but that of esquire, or gentleman, was rare before 1 Hen. V.

We read that J. Kingston was made a gentleman by king Richard II.

As it may justly be asked what constitutes a gentleman with us? the reply is easy; being a gentleman, is being entitled to bear arms. And Mr. Camden observes, that the distinction of a gentleman of coat-armour, or an upstart, and a gentleman of blood, is the bearing of arms from the grandfather; and that he who bears arms from his grandfather is to all intents and purposes a gentleman of blood; for which cause it is requisite by the statutes of the Bath that every knight be fore his admission, prove himself to be so qualified, which done, he carries with it, if his merit be equal, a passport also to the order of the Garter. *Notitia Anglica, p. 24. See also Doddridge's Honour's Pedigree, p. 147. Smith, De Republ. Angl. & Porteseve, fol. 82.*

Gaillon, in his chapter of gentlemen, says, that they have their beginning either of blood, as being born of worshipful parents; or that they have done something, either in peace or war, when by they deserve to bear arms, and be accounted gentlemen. He farther says, chap. xxiv. if a gentleman be found apprentice to a merchant or other trader, he hath not thereby lost his gentility; and he desires it may be remembered, for the honour of trade, that king Henry VI. though it no dishonour to him, when he quitted his queen, to take to his wife Anne, the daughter of Thomas Bullen, some time mayor of London. To which may be added the thought, that the first William, who founded our royal race, was the grandson of a tanner.

Sir Edward Coke says, that esquires and gentlemen are

only names of worship, and not of dignity. And before these the heralds rank all colonels, serjeants at law, and doctors in the three learned professions. See PRECEDENCE.

Sir Thomas Smith (*ubi supra*) says, that whosoever studieth the laws of the realm, or studieth in the university, or professeth the liberal sciences; and (in short) who can live idly, and without manual labour, and will bear the port, charge, and countenance of a gentleman, shall be called master, and shall be taken for a gentleman.

**GENTLEMAN** *Usher of the Black Rod*, is the chief gentleman usher to the king, called in the black book "Lator virgæ nigre, et bastiarius," and elsewhere "Virgæ bajulus." His duty is to bear the rod before the king at the feast of St. George at Windsor; he has also the keeping of the chapter-house door, when a chapter of the order of the garter is sitting; and in time of parliament attends the house of peers. His badge is a "black rod," with a lion in gold at top. This rod has the authority of a mace; and to his custody all peers questioned for any crime are first committed.

**GENTLEMAN of the Bed-chamber.** See BED-CHAMBER.

**GENTLEMEN of the Chapel**, are officers whose duty and attendance are in the royal chapel, being in number thirty; ten whereof are priests, and the other twenty called *clerks of the chapel*, who assist in the performance of Divine service. One of the first ten is chosen for confessor of the household, whose office it is to read prayers every morning to the household servants; to visit the sick, examine and prepare communicants, and administer the sacrament.

Another, well versed in music, is chosen first organist; who is master of the children, to instruct them in music, and what is necessary for the service of the chapel: a second is likewise an organist; a third a lutenist; and a fourth a violist.

There are likewise three vergers, so called from the silver rods they usually carry in their hands; being a serjeant, yeoman, and groom of the vestry: the first attends the dean and sub-dean; finds surplices and other necessaries for the chapel; the second has the whole care of the chapel; keeps the pews, and seats the nobility and gentry; the groom has his attendance within the chapel-door, and looks after it.

**GENTLEMEN Pensioners.** See PENSIONERS.

**GENTLEN**, in *Geography*, a town of Germany, in the duchy of Magdeburg; 30 miles N.E. of Magdeburg.

**GENTLEWOMAN**, **GENEROUSA**, is a good addition for the estate and degree of a woman, as *generosus* is for that of a man; and if a gentlewoman be named spinster in any original writ, appeal, &c. it hath been held that she may abate, and quash the same. (2 Inst. 658.) But it seems that spinster is in general a good addition for an unmarried woman, as single woman is for one who, being unmarried, hath had a ballard.

**GENTOOS**, in *Modern History*, according to the common acceptation of the term, denote the professors of the religion of the Bramins (see **BLACHMANS**), who inhabit the country called Hindoostan, in the East Indies, from the word *Jan*, a *region*, and *hind* or *hindoo*; which Feristeh, as we learn from colonel Dow's translation of his History, supposes to have been a son of Ham, the son of Noah. It is observed, however, that Hindoo is not the name by which the inhabitants originally styled themselves, but according to the idiom of the Shanferit, which they use, *jumbodeep*, from *jumboo*, a *jackall*, an animal common in their country, and *deep*, a large portion of land surrounded by the sea, or *Ubertekbant*, from *kbant*, i. e. a *continent*, and *Ubrerrut*, the

name of one of the first Indian rajahs. It is also observed, that they have assumed the name of Hindoos only since the era of the Tartar government, to distinguish themselves from their conquerors, the Mussulmen. The term *Gentoo*, or *Gan*, in the Shanferit dialect, denotes *anim.* in general, and in its more confined sense *mankind*, and is never appropriated particularly to such as follow the doctrines of Bramina. These are divided into four great tribes, each of which has its own separate appellation; but they have no common or collective term that comprehends the whole nation under the idea affixed by the Europeans to the word *Gentoo*. Mr. Halhead, in the preface to his translation of the "Code of Gentoo Laws," conjectures that the Portuguese on their first arrival in India, hearing the word *gan* so freely in the mouths of the natives, as applied to mankind in general, might adopt it for the domestic appellation of the Indians themselves, or, perhaps, their bigotry might force from the word *Gentoo* a fanciful allusion to *gentile* or *pagan*. The Hindoos, or *Gentoo*s, vie with the Chinese as to the antiquity of their nation. They reckon the duration of the world by four jogues, or distinct ages; the first is the *Suttie jogue*, or age of purity, which is said to have lasted about 3,200,000 years, during which the life of man was 100,000 years, and his stature twenty-one cubits; the second, the *Tirtah jogue*, or the age in which one-third of mankind were reprobate, which consisted of 2,400,000 years, when men lived to the age of 10,000 years; the third, the *Dwajuar jogue*, in which half the human race became depraved, which endured to 600,000 years, when men's lives were reduced to 1,000 years; and fourthly, the *Collee jogue*, in which all mankind were corrupted, or rather diminished, which the word *colle* imports. This is the present era, which they suppose will subsist for 400,000 years, of which near 5,000 are already past, and man's life in this period is limited to 100 years. It is supposed by many authors, that most of the *Gentoo shafters* or scriptures, were composed about the beginning of the *collee jogue* or *cal jug*, of which, according to Mr. Dow, the year of Christ 1769 was the 4887th; but an objection occurs against this supposition, *viz.* that the shafters take no notice of the deluge; to which the Bramins reply, that all their scriptures were written before the time of Noah, and the deluge never extended to Hindoostan. Nevertheless it appears from the shafters themselves, that they claim a much higher antiquity than this; instances of which are recited by Mr. Halhead.

After all, it must be allowed, that persons of sagacity and good judgment have made it appear with sufficient evidence, that the oldest accounts of the Hindoo nation do not, in reality, go further back than to the deluge mentioned in the books of Moses, and that their religious institutions were consequently posterior to that event. Sir William Jones says, (*Dissertations relating to Asia*, vol. i. p. 199.) that the first corruption of the purest and oldest religion, which consisted in the worship of one God, the maker and governor of all things, was the system of the Indian theology, invented by the Bramins, and prevailing in those territories, where the book of Mahabud, or Menu, is at this time the standard of all religious and moral duties. In his preface to the "Institutions of Menu," (see **MENU**) he says, they are supposed by the Bramins to have been promulgated by Menu, the son or grandson of Prahma, or the first of created beings. This work he supposes to have been written about 200 years after the Vedas, or about 1280 years B. C. Sir W. Jones is of opinion, that the origin of the Hindoo nation and government is to be looked for in Iran, or Persia, where a great monarchy was established before the Assyrian, called by the oriental historians the "Pishdadian dynasty;" and they say, that

that the first of these ancient monarchs, whom they call Mahabad, or Manu, received from the creator a sacred book, in a heavenly language, meaning the "Vedas," (Diff. relating to Asia, vol. ii. p. 111.) This first monarch, they also say, divided the people into four orders, the religious, the military, the commercial, and the servile. (Diff. &c. vol. i. p. 107-206.) In the reign of Hushang, the third of the Pishaladian race, a reformation, he says, was made in the religious system, when the complex polytheism of the preceding times was rejected, and religion was reduced to what is called "Sabaism," which consisted chiefly in the worship of the sun, moon, and stars; but it is probable, that sabaism, being a more simple form of religion than that of the Hindoos, must have preceded it. The laws of Mahabad, however, were retained, and his superstitious veneration for fire. Upon this change, the favourers of the old religion retired to Hindoostan, and their oldest existing laws forbid them ever to return, or to leave the country they now inhabit.

Another reformation, or change, in the system, was made, he says, under Gushtasp, in the next, or "Kaiasite dynasty," thought to have been the same with Darius Hystaspis. This was effected by Zeratust, or Zoroaster; he introduced genii, or angels, presiding over months and days, new ceremonies in the veneration shewn to fire, and gave out a new work, which he said came from heaven, but at the same time established the adoration of the Supreme Being. This work was lost at the conquest of Persia by the Mahometans; but the priests of that religion have composed another from what they were able to recollect of their institution. It is called "*Zendavesta*," which see. The followers of Zeratust, now called "Gebres," or Parisis, persecuted those of the religion immediately preceding, and these also took refuge in India, where they wrote a number of books, which are now very scarce. They resemble, according to the account of sir William Jones, the Hindoo sects of "Sauras," and "Saguinas," of which the last is very numerous at Benares.

Another innovator in the religion of the East, before the Christian era, was "Budda," (see BOODHI), generally supposed to have been the same with the Fo (see Fo) of the Chinese, the "Somonocodom" of Siam, the "Xaca" of Japan, and the "Odin" of the north of Europe. According to sir W. Jones, he disapproved of the Vedas, because they enjoined the sacrifice of cattle; and made his appearance in the year 1027 B. C. His disciples were thought to have been the same with the "Sanmanes," who were opposed to the Brahmans of the Greek historians. But these Sanmanes were, it is probable, of much greater antiquity, as was also Somonocodom. The followers of Budda gave great umbrage to the Bramins, who never ceased to persecute them till they had effected their extirpation from Hindoostan by fire and sword, about 500 years ago. There is, however, a great resemblance between the system of the Hindoos and that of Budda; and perhaps with a view to conciliate these people, the Bramins of Cali make Budda the 9th *avatar* or transformation of Vishnow. This religion is that which prevails in India beyond the Ganges; it was received in China A. D. 65, and is established in Japan. A religion, very similar to this, is also that of the Lamas of Thibet. Indeed, all deviations from the original Hindoo system, retained the same general principles. The advocates of them all held the doctrine of the pre-existence of souls, their subsisting and acting independently of bodies, and their transmigration into other bodies after death. They had the same low opinion of matter, and the same veneration for the elements of fire and water, as purifiers of the soul. They had similar restrictions with respect to food, the same addict-

edness to divination, and the same idea of the use of corporeal austerities for the expiation of sin.

There can be no doubt of the very high antiquity of the religion of the Hindoos, and it is not improbable that the commencement of all those systems which deviated from the religion of the patriarchs, preserved in the writings of Moses, was prior to the general dispersion of mankind. A system so ancient as that of the Hindoos must have been formed about the same time with that of the Egyptians, from which that of the Greeks, and other western nations, was in some measure derived; and accordingly many points of resemblance have been observed between them; too many, and too striking to have been altogether fortuitous. Even some of the inhabitants of Ethiopia appear to have been of the same origin with those of Hindoostan (see Diff. relating to Asia, vol. i. p. 112.); and both the Egyptians and Ethiopians seem to have had some connection or intercourse with the Hindoos; but of what kind it was, or when it subsisted, we have no certain account; and they have been so long separated, that at present they are in total ignorance of each other. According to Eusebius and Syncellus, some people from the river Indus settled in the vicinity of Egypt in the reign of Amenophis, the father of Sesostris, and many Egyptians, banished by their princes, settled in other countries, and some went so far as India. It is also supposed, that many of the priests of Egypt left the country on the invasion of it by Cambyfes. But such circumstances as these are not of themselves sufficient to account for the great resemblance between the two systems. The Hindoos themselves say, that their sacred books came from the west, (see Ezourvedam, p. 15-17.) But the Hindoos, as well as their books, most probably came from that quarter, and their sacred books were composed while the seat of the empire was in Persia. The affinity of the Egyptians and Hindoos may be inferred from the similarity that subsists between some Egyptian words and those that occur in the ancient language of Hindoostan. The names and figures of the 12 signs of the zodiac, among the Hindoos, are nearly the same with ours, which came from Egypt through Greece, and each of these is divided into 30 degrees. Moreover, both the Egyptians and Hindoos had also the same division of time into weeks, and they denominated each day by the names of the seven planets. The resemblance between the oriental and occidental systems extends much farther than Egypt. The office and power of the Druids in the northern parts of Europe did not differ much from those of the Bramins; and the Etruscans, from whom the Romans derived the greatest part of their learning and religion, had a system very much resembling that of the Persians and Indians, and they wrote alternately to the right hand and left. (See ETRUSCAN.) Several remarkable "general principles" were held alike by the ancient Egyptians and the modern Hindoos. They both believed that the souls of men existed in a prior state, and that they go into other bodies after death. They had the same ideas of the body being a prison to the soul, and imagined that they could purify and exalt the soul by the mortification of the body; and from the idea of the great superiority of spiritual to corporeal substances, they held all matter in great contempt. They also both believed that plants had a principle of animation. Several religious ideas and customs were common to both countries. The Egyptians of Thebais represented the world under the figure of an egg, which proceeded from the mouth of Cneph; and this resembled the first production according to the Hindoo system. Several of the Egyptian deities were both male and female, which corresponds to the figure of the "lingam" with the Hindoos. This obscene figure, or at least the "phallus,"

was much used in the Egyptian worship, and from Egypt it was carried into Greece, where it was used in the mysteries of Bacchus. Besides, the lascivious postures of the Egyptian women before their god Apis, were the same with those of the Hindoo women, before their idols, (see BRACHMANS): and, moreover, the Hindoos chuse their sacred bulls by the same marks that were used by the Egyptians. The Egyptians worshipped the Nile, as the Hindoos do the Ganges: the pyramidal or conical form of the Egyptian temples resembled that of the pagodas: and the onion, which was held in veneration by the Egyptians, is not eaten by the Hindoos. Besides this resemblance of general principles, and religious customs, it is observable, that the Hindoos, Egyptians, and Greeks adopted the same gods, and paid homage to them under similar representations or images. The Egyptians held cows in much greater veneration than any other animal: they were sacred to Isis, and never sacrificed. That the cow was respected by the Hindoos is well known. Upon the whole, it is undeniable that a system, very similar to that of the present Hindoos, must have been of very great antiquity, and prior to the general dispersion of mankind. For though similar situations may lead to similar sentiments, and corresponding practices, the above-mentioned similarity, which might be traced in a much greater number of instances, extends to too many particulars, to admit our accounting for it in this way: nevertheless, it is impossible that a system, so extensive and complex, and implying such abstruse metaphysics, as that of the Hindoos, should have been completed at a very early period. This must have been subsequent to the rudest age of mankind; and, therefore, we may well imagine, that it could not have had its origin long before the time of Moses. Whether the Jewish law-giver was acquainted with it or not, it will appear to any candid as well as accurate examiner of the one or the other, that he was far from deriving any advantage from it; nor is there in his writings any allusions to books pretended to be sacred, such as the Vedas, but only to such *practices* as were common to the Hindoos and other heathen nations.

The Hindoos seem to have preserved the knowledge of the Supreme Being, when the Greeks, and other more polished nations in the western parts of the world, had lost sight of him; their attention being ingrossed by inferior objects of worship. Some of their descriptions of the deity are just, and truly sublime. In the "Institutes of Menu" he is said to be "one whom the mind alone can comprehend, whose essence eludes the external organs, who has no visible parts, who exists from eternity, the soul of all beings, whom no being can comprehend." They also say, that "goodness is the very essence of God." (See BRACHMANS.) Nevertheless, the most sublime conceptions of Deity entertained by the Hindoos fall far below those that were formed of him by the Hebrews, and which are recorded in the sacred writings. In the Hindoo system the first production of the Supreme Being was something similar to the chaos of Moses. an earth covered with water; and they speak of the "spirit of God" as moving upon it. One of the Hindoo fables, related by father Bouchet (Ceremonies of Religion, p. 38.) bears some resemblance to the mosaic history of Paradise. The Hindoos say that the first man was called "Adam," and the first woman "Manan-iva." The Hindoos have also a peculiar day of the week, which they appropriate to acts of religion, as prayer and fasting: and in agreement, at least in part, with the account of Moses, the Hindoos say that in the first ages of the world men were greatly superior to the present race both in the length of their lives, and in the powers both of body and mind; but that, in consequence of vice, they gradually declined. The Hindoos have also pre-

served an unequivocal tradition of an universal deluge; and according to the "Puranams," books which are said to contain a faithful account of their doctrines, eight persons escaped the general deluge. A curious account of the intoxication of Noah, and of the behaviour of his three sons on the occasion, is given us from the Hindoo writings in the third volume of "Asiatic Researches." The 4th and 5th "avatar" of the Hindoos, as Sir W. Jones says (Diff. &c. v. i. p. 110.) relate to the punishment of impiety, and the humiliation of the proud; and refer, as he thinks, to the dispersion from Babel. In the "Bagavadam" there are, besides the mosaic account of the deluge, the principal circumstances of the history of Hamael, and the sacrifice of Isaac. Several things occur in the Hindoo traditions, which greatly resemble some in the history of Abraham; and Brahma, the Hindoo law-giver, very much resembles this ancient patriarch.

The several institutes contained in the collection of the Gentoo laws, which we shall presently notice, are interwoven with the religion of the Gentoos, and revered as of the highest authority. The curious reader will discover an astonishing similarity between the institutes of this code and many of the ordinances of the Jewish law, between the character of the Bramins or priests, and the Levites; and between the ceremony of the scape-goat, under the Mosaic dispensation, and a Gentoo ceremony, called the *abandoned jug*, in which a horse answers the purpose of a goat. In this code we find some of the more extraordinary laws and customs of the Hebrew nation, such as were never received in the western part of the world; as that of a man taking the widow of his brother, in order to keep up his family. Polygamy appears also to have been allowed to the Hindoos, as it was to the Hebrews. Many obsolete customs and usages, alluded to in many parts of the Old Testament, may also receive illustration from the institutes of this code. It appears from the code, that the Bramins, who are the priests and legislators of the country, have resigned all the secular and executive power into the hands of another cast or tribe; and no Bramin has been properly capable of the magistracy since the time of the suttee jogae; the only privilege of importance which they have appropriated to themselves is an exemption from all capital punishment; they may be degraded, branded, imprisoned for life, or sent into perpetual exile: but it is every where expressly ordained, that a Bramin should not be put to death on any account whatsoever.

Among the Hindoos there is a considerable difference of opinion on the subject of creation; but in the following general outline they seem to be all agreed. They say, that after the Supreme Being had existed alone from all eternity, he resolved to produce other beings. But this production was wholly "from his own substance;" and after a certain period, they believe that every thing will be absorbed into him again, when he will exist alone as before. There will, however, be a succession of these creations and absorptions without end. At what time the first creation took place they do not say; but according to them, every thing that now exists has existed before, and will hereafter exist again. The great superiority of the spiritual to the corporeal part of man is the fundamental doctrine of the Hindoo system; and hence springs the satisfaction which the Hindoos always express on the separation of them. From the Indian philosophy it is probable that the Manicheans had their idea of an original difference in souls, some being necessarily good, and others bad. That all nature is animated, and that the souls which animate the lowest forms of things are capable of rising to the highest state, is asserted in the "Institutes of Menu."



Menu." Thus it is said, "the souls that animate worms and insects, serpents, moths, bealls, birds and vegetables, attain heaven by the power of devotion."

The doctrine of transmigration is one of the distinguishing tenets of the Gentoos. With regard to this subject it is their opinion, according to Mr. Holwell, that those souls which have attained to a certain degree of purity, either by the innocence of their manners, or the severity of their mortifications, are removed to regions of happiness, proportioned to their respective merits; but that those who cannot so far surmount the prevalence of bad example, and the powerful degeneracy of the times, as to deserve such a promotion, are condemned to undergo continual punishment in the animation of successive animal forms, until, at the stated period, at other renovation of the four jogues shall commence, upon the dissolution of the present. They imagine six different spheres above this earth, the highest of which, called *sutee*, is the residence of Brhimā, and his particular favourites. This sphere is also the habitation of those men who never uttered a falsehood, and of those women who have voluntarily burned themselves with their husbands; the propriety of which practice is expressly enjoined in the code of the Gentoo laws. This code, printed by the East India company in 1776, is a very curious collection of Hindoo jurisprudence, which was selected by the most experienced pundits, or lawyers, from curious originals in the Sanscrit language, who were employed for this purpose from May 1773 to February 1775; afterwards translated into the Persian idiom, and then into the English language, by Mr. Halhed.

We have already observed, that the Hindoos are divided into four great and original tribes, which, according to the Gentoo theology, proceeded from the four different members of Brhimā, the supposed immediate agent of the creation under the spirit of the Almighty. These tribes are the Bramins, which proceeded from his mouth, and whose office is to pray, read, instruct, and conduct the sacrifices; the Cheltee, which proceeded from his arms, whose office is to draw the bow, to fight, and to govern; the Bice, proceeding from the belly or thighs, who are to provide the necessaries of life by agriculture and traffic; and the Sooder from the feet, which are ordained to labour, serve, and travel. See CAST.

Few Christians, says the translator of the Gentoo Code, have expressed themselves with a more becoming reverence of the grand and impartial designs of Providence in all its works, or with a more extensive charity towards all their fellow-creatures of every profession, than the Gentoos. It is, indeed, an article of faith among the Bramins, that God's all-merciful power would not have permitted such a number of different religions, if he had not found a pleasure in beholding their varieties.

Mr. Holwell, and also Mr. Dow, attempt to exculpate the Hindoos from the charge of polytheism and idolatry. "Let us rest assured," says the latter, "that whatever the external ceremonies of religion may be, the same infinite being is the object of universal adoration." But though the Hindoos acknowledge one Supreme Being, from whom all power is derived, they suppose that the immediate government of the world is placed by him in other hands. To these inferior deities their prayers and religious services are externally addressed; and this worship is encouraged and enjoined in their sacred books. According to their system, there sprung from the Supreme Being, as emanations of his divinity, an infinite number of subaltern deities and genii, of which every part of the visible world was the seat and temple. These intelligences did not barely reside in each part of nature; but they directed its operations, each element being

under the guidance of some being peculiar to it. These inferior gods, being of various and opposite disposition and character, their worshippers adopted different methods of deprecating their anger, and soliciting their favour. Hence proceeded a great variety of whimsical and absurd, and also of cruel and dreadfully, as well as impure, rites. The veneration of the Hindoos for the images of their gods subjects them justly to the charge of idolatry and polytheism; although the learned Bramins pretend, that they do not worship the visible idol, but the invisible being represented by it. Mr. Bonnerat says that, besides those whom the Hindoos place in the rank of gods, they have also "saints," whose pictures they place in their temples, and that they address prayers to them as well as to their gods. Nor let it be said, that these are the accounts of travellers. In the sacred books of the Hindoos mention is made of various divinities besides the Supreme Being. The worship of the sun, says Sir W. Jones (Diff. &c. v. i. p. 481.) is principally recommended in the Vedas. The "Institutes of Manu" say, that "the Supreme Being created an assemblage of inferior deities, and divine attributes, and pure souls, and a number of genii exquisitely delicate." In this work mention is also made of "orders of demi-gods that are wafted in airy cars, genii of the signs and lunar mansions, &c." The worship paid to the manes, or ancestors, is a great article in the system, and is mentioned almost in every page of the "Institutes." All the neighbouring nations whose religions have some affinity to that of the Hindoos are polytheists. The ancient religion of the northern European nations was, in several respects, similar to that of the East; and we find among them the acknowledgment of one Supreme God, with the worship of several inferior ones. Thus, their deities, Odin the god of war, Frea his wife, and Thor the god of thunder, were the principal objects of worship to all the Scandinavians.

It has been said that the polytheism of the Hindoos, and others, was mild and tolerant in its nature; but the fact is, that like the ancient Egyptians, they quarrelled with one another on account of their attachment to different deities, especially in Malabar; and mild as the religion of the Hindoos appears to be, and gentle as are their general manners, they can assume a very different character when their religion is concerned. The Bramins exterminated the Sammanians, and the followers of Buddha, with fire and sword, leaving none of them on the west side of the Ganges, under a pretence of their being atheists; and when any Hindoo is converted to Christianity, he is not only banished from his tribe, but abandoned to the insults of the whole nation. Such also was the treatment of those who were excommunicated by the Druids. The Hindoos regard all Christians with the utmost abhorrence and detestation, as much below the lowest of their own sects. The Bramins themselves can be cruel and malignant, where their religion is concerned. Nevertheless, when the Hindoos converse with Christians on the subject of religion, they profess to believe, as we have already observed, that the Supreme Being is equally pleased with all religions, and intended that all the different modes of it should be adopted by different nations.

Although there are many points of resemblance between the religion of the ancient Egyptians and that of the Hindoos, yet in many respects they are exceedingly different; so that though they may have gone together at the first, they must have separated at a very early period. The Hindoos never worshipped living animals, which is a principal feature in the religion of the Egyptians; and the names, the characters, and the images of their deities have very little resemblance to each other. But between the religion and mythological fables of the Greeks and those of the Hindoos,

there is a very remarkable resemblance; though we are unable to trace any connection that ever subsisted between them.

The religion of the Hindoos seems to be much too complex to have been, as sir W. Jones supposes, the oldest system of polytheism and idolatry. It is evidently a refinement on something much more simple, and this seems to have been the system of the "Sammanes," whom the Greek writers mention as a sect of philosophers in India, opposed to the "Brachmanes," and to be the same with those who are now called "Schamans" in Siberia. See SAMANCANS.

Nothing can be more humiliating than the situation to which the Hindoo institutions reduce the female sex. According to the Vedas, the souls of women, as well as those of all individuals of the inferior castes, are condemned to continual transmigrations, till they are regenerated in the bodies of men. The same unfavourable character is amply justified by the representations that occur in the "Institutes of Menu," and the "Code of Gentoo laws." Such being, in the opinion of the Hindoo law-givers, the natural character of women, it is no wonder that little regard is paid to their evidence in courts of justice; nor can we be surpris'd, that the birth of a female is no cause of rejoicing in a Hindoo family. In perfect agreement with such degrading ideas of the female character, the women must always be under the absolute controul of men; nor has the subjection of the wife to her husband any bounds. As women are treated in this disrespectful manner, and considered as unqualified to read their sacred books, they are in general very ignorant, so that few of them can either read or write.

The devotion of the Hindoos is supposed to comprise all other duties; but their devotion consists in the frequent repetition of the names and attributes of God. The first thing in their prayer is to pronounce the word *om*, then excluding all sensible objects, even forbearing to breathe, and to think only on God. This kind of prayer serves for the pardon of sin and purification. This word *om*, on the pronunciation of which so much is supposed to depend, signifies, according to sir W. Jones, Brahma, Vishnou, and Seva, or the three powers of creation, preservation, and destruction. This mystical word, he conceives, may be the Egyptian *ou*, commonly supposed to mean the sun, and by the ancient idolaters the solar fire. The religion of the Hindoos consists principally in oblations to the gods, *i. e.* to the inferior deities, and to the manes of their ancestors; and these oblations are accompanied with many frivolous ceremonies. Moreover, a great part of their religion consists in the austerities to which they subject themselves. Among other things, all fermented or spirituous liquors are forbidden, and they submit to various restrictions with regard to their food. To a genuine Hindoo nothing appears more heinous than the killing, and much more the eating of any thing that had life. The Hindoos are much devoted to pilgrimages for the purpose of bathing in distant rivers; and they generally prefer the Ganges. In these pilgrimages, they practise singular austerities. Their fasts in honour of different deities are of long duration, and are very strictly observed; and they are thought to have singular efficacy in effacing all sins. See FAOTINS.

It is not uncommon with the Hindoos to devote themselves to certain and very painful death, under the influence of their wretched superstition. They throw themselves on the large iron hooks that are fastened to the wheels of the carriages, which carry the images of their deities in procession. Others lie sprawling on the ground for the wheels to pass over them, and crush them to death. But the most affecting instances of involuntary death are those of the Hindoo women, who burn themselves alive with the

bodies of their deceased husbands. In this way of terminating life they indulge the hope of attaining the same state of happiness with them after death. This is deemed a kind of religious duty, though it is not regarded as of universal obligation. On the deaths of persons of high rank and celebrity, these victims of superstition, voluntary, or involuntary, are sometimes very numerous. At the death of a king of Tanjore, no less than 300 of his concubines leaped into the flames, and 400 burned themselves at the funeral of a naique, of Madura. (Maurice's Ind. Antiq. vol. ii. p. 165.) The Hindoo religion, which has been extolled as the mildest of all religions, formerly enjoined and countenanced human sacrifices; and sir William Jones says, that the ancient solemn sacrifice of the Hindoos was that of a man, a bull, and a horse. Among other superstitious notions and practices prevalent among the Hindoos, we may mention their excessive veneration for the cow, and also for the elements of fire and water. Penances of a singular and severe nature were enjoined for killing cows without malice; and if this crime was maliciously committed, it admitted of no expiation whatever. Mr. Wilkins informs us, (Sketches relating to the history, &c. of the Hindoos, vol. i. p. 234.) that the Bramins are enjoined to light a fire at certain times, and that it must be produced by the friction of two pieces of wood of a particular kind; that with a fire thus procured their sacrifices are burned, the nuptial altar flames, and the funeral pile is kindled. Their veneration for water, especially that of the Ganges, has already been mentioned; and persons chuse to die in rivers from an idea, that the soul passing through the water, as it leaves the body, is purged from its impurities.

The Hindoo religion is little, if at all, more unexceptionable than the ancient Egyptian, with regard to the extravagance and indecency of many of its ceremonies. Instances occur at their pagodas, which we have already noticed under the article BRACHMANS, and which it is needless here to repeat. (See also PAGODA.) Charms are also held in estimation among the Hindoos; a regard to them is authorized by their sacred books, and the practice of incantation is professed by their learned Bramins. From a veneration for the elements of fire and water, and an opinion of their possessing somewhat of divinity, they have been deemed proper tests of guilt, or of innocence. Hence has proceeded the trial by *Ordeal*; which see. With regard to the Hindoo doctrine of a future state, Mr. Dow says, that men first atone for their crimes in hell, where they remain for a space of time proportioned to the degree of their iniquities; then they rise to heaven, to be rewarded for their virtues, and thence they will return to the world to re-animate other bodies. The more learned Bramins, he says, affirm that the hell which is mentioned in the "Bedang" is only intended as a bug-bear to the vulgar; agreeably to the doctrine of the Greek philosophers. On the other hand, Mr. Holwell, contrary to all other accounts, which represent future punishment as in all cases finite, says, that whoever shall free himself by violence from this mortal body, shall be plunged in "Onderah" for ever. According to another account of the religion of Malabar, they who destroy themselves go neither to heaven nor hell, but stroll about, and become what are called "Spirits," under the power of the chief of the devils. Sometimes they enter into men, and then they become demoniaes, and go about naked and mad, to disturb the neighbourhood, eating grass and raw flesh. According to the Indians, says P. Della Valle, some very wicked men become devils. To conclude our account of the Hindoos, or Gentoos, we observe, that notwithstanding the

the unrequitable strokes which they lay on more external observances of various kinds, there are not wanting in their writings some excellent moral maxims, similar to many in the books of the Old Testament, which represent every thing of this kind as insignificant, without moral virtue. A peculiar stroke, we find, even too great, is laid on the duties to parents; so as to supersede the obligation, and to depreciate the importance of other duties. Upon comparing the Hindoo system with that of Moses, the absurdity of the former is as apparent as the superior wisdom of the latter. With the Hindoos we perceive the rudiments, and more than the rudiments, of most of the arts and sciences, especially that of astronomy, of which most other nations are wholly ignorant. And yet while the Hebrews made no discoveries in science, they had a religion perfectly rational; and that of the Hindoos was absurd in the extreme. This, surely, is an argument of the internal kind in favour of the divine origin of the Hebrew religion, almost as irresistible as any argument from miracles. From the preceding sketch of the Hindoo religion, we must be led to acknowledge the necessity and utility of a divine revelation.

Those who are desirous of being farther acquainted with the principles, manners, and various institutes of the Gentoos, may consult Holwell's *Interesting historical Events, &c.* 1766. Dow's *History of Hindoostan*, 4to. 1768. and the *Code of Gento Laws*. Priestley's *Comparison of the Institutions of Moses with those of the Hindoos and other Ancient Nations*, 8vo. Northumberland, in America, 1799. For a further account of the religious tenets and practices of the Gentoos, see BRACHMANS. See also SHASTAH and VIEDAM.

GENT-SING, in *Geography*, a town of China, in Setchuen; 87 miles N.W. of Hoo-li.

GENUFLEXION, of *genu*, knee, and *flecto*, I bend, the act of bowing, or bending the knee; or rather of kneeling down.

The Jesuit Rosweyd, in his *Onomasticon*, shews, that genuflexion, or kneeling, has been a very ancient custom in the church, and even under the Old Testament dispensation; and that this practice was observed throughout all the year, excepting on Sundays, and during the time from Easter to Whitfuntide, when kneeling was forbidden by the council of Nice.

Others have shewn, that the custom of not kneeling on Sundays had obtained from the time of the apostles; as appears from St. Irenæus and Tertullian; and the Æthiopic church, scrupulously attached to the ancient ceremonies, still retains that of not kneeling at divine service. The Russians esteem it an indecent posture to worship God on their knees. Add, that the Jews usually prayed standing. Rosweyd gives the reasons of the prohibition of genuflexion on Sundays, &c. from St. Basil, Anastasius, St. Justin, &c.

Barenus is of opinion, that genuflexion was not established in the year of Christ 58, from that passage in Acts x. 26. where St. Paul is expressly mentioned to kneel down at prayer; but Saurin shews, that nothing can be thence concluded.

The same author remarks, also, that the primitive Christians carried the practice of genuflexion so far, that some of them had worn cavities in the floor where they prayed: and St. Jerome relates of St. James, that he had contracted a hardness on his knees equal to that of camels.

GENUS, in *Algebra*. The ancient algebraists distributed that art into two genera, or kinds; the *logistic*, and *musicus*; which, &c.

Genus, in *Systematic Botany*, from *gennō*, a family, implies one or more species of plants, differing essentially in their parts of fructification from all others, and agreeing together in the general structure of those parts, as well as in one or more peculiar marks or characters. If a genus be perfectly natural and distinct, such characters in the fructification are accompanied with more or less decided distinctions in the other parts of the plant, as well as in its general habit or aspect. On this principle it is contended by Linnæus and his school, that all genera are, or ought to be, natural, and that the genus ought to give the character, not the character the genus. The same principle is extended to the animal kingdom. Botanists of the French school, on the contrary, maintain that all such associations and distinctions are merely arbitrary, serving to facilitate the study of plants, but not at all founded in nature. It is singular that, with such ideas, these philosophers should not only strenuously contend for a natural system of arrangement, but object to the Linnæan method, whose facility cannot be disputed, merely because it is not natural, terming it in their language *lex nature*. If genera are not natural, certainly the more comprehensive assemblages, of such genera into orders and classes, can, in no sense, be so. We nevertheless do not scruple to allow, that the principles of all such distinctions are founded in nature, though we readily admit that no system has as yet applied them correctly to practice, even with regard to generic, and far less to classifical, distinctions. The latter indeed have been scarcely found capable of definition, or in so vague a manner as to leave us most in doubt where precision is most wanted; and were it not for that intuitive, or, at least practical, perception of affinities and differences, which is, by the French, contended to be inadmissible in judging of genera, we could certainly come at no knowledge of most of the natural orders of these learned writers.

Examples of natural genera, each characterized by an essential character of its own, which distinguishes it, not only from every other genus in its natural order, but from every one hitherto discovered, are found in *Quercus* the Oak, whose acorn affords such a character; in *Trojan*, whose singular quadrangular nut is armed with spines that once constituted the calyx-leaves; in *Parnassia*, so well marked by the fringes and lucid balls that border its nectaries; in *Soldanella* with its many-cleft monopetalous corolla, and *Elæcarpa*, whose polypetalous one is similarly cut; in *Geoffrea*, the only known instance of a papilionaceous flower with a drupa; not to mention a great number besides. Instances of good natural genera, distinguished by some one essential character from all others in their natural order, are found in *Echium*, whose irregular corolla keeps it distinct from all others of the *Asp. trifoliate*; *Cornucopia*, known from all other grasses by its remarkable involucren; *Plagiella* distinguished from its allies by the globose figure; *Ranunculus* by the nectariferous pore in the claw of each petal; *Vella* by the prominent dilated partition of its pouch, extending twice as far as the valves; to which may be added many genera of the class *Didymia Gymnospermia*; see Smith's *Introd. to Botany*, 424. The Linnæan *Aspidria Polygamia* affords one of the most perfect examples possible of a natural class and order, of which all the genera are natural, and so well distinguished in habit, that any person, an observant of plants may know them by their foliage, inflorescence, or general appearance, while their fruit affords clear essential generic characters. The natural families of *Crotalaria*, as arranged by Swartz and Brown, come very near the same point of perfection, but their differences of habit are less obvious. Such instances ought to instruct and direct practical botanists to "go on from one degree of perfection to another."

another," though, like the christian moralist, he cannot hope to reach the summit.

Lamarck has very well traced the indistinct origin, and gradual improvement of generic knowledge among botanists. In an early state of the science, some general affections were formed, though founded on vague and unphilosophical principles. The idea and name of a rose soon embraced many different species, and hence the dog-rose, the white-rose, the damask-rose, &c. were distinguished from one another, and a sort of generic and specific nomenclature arose, finally extended systematically to every plant by Linnæus. Caspar Bauhin in his *Pinax*, anno 1623, first distributed plants under a kind of generic sections, with some mention of the peculiar characters of each; but he did not profit, as he ought to have done, of the great principle first inculcated by Conrad Gesner, that the parts of the flower and fruit afford the only clue to a scientific distribution of vegetables; a principle to which "the very existence of botany, as a science, is owing." Tournefort at length, adopting this maxim, undertook the arrangement of all known plants into genera, illustrating each by a figure of the parts of fructification, so as to display their distinguishing characters; but it was reserved for Linnæus to define those characters in words, and thus to perfect the plan of Tournefort, as well as to reform it in many points, and correct some fundamental defects. He extended moreover his improvements to the clear definition and nomenclature of the species, which Tournefort had, without discrimination, merely collected, by their old appellations, under each of his genera, except indeed that he preserved an uniformity in their generic names.

Linnæus did not at once hit upon the best manner of defining his genera. His first aim was to describe all the seven parts of fructification in each, so that their differences might appear, which is the plan of all the editions of his *Genera Plantarum*. At length, in the sixth edition of his *Syst. Nat.*, published in 1748, he undertook a synoptical table of the short essential characters of the genera, and in the tenth he carried this plan nearly to the perfection in which he left it at his death. It has been adopted, not only by his pupils, and the followers of his system of classification, but even by the celebrated Jusseu and his scholars, who have widely differed from the learned Swede as to other principles of arrangement, and who have certainly not improved upon his style of definition, terminology, or nomenclature. Jusseu indeed has, like Goran, subjoined to the generic characters taken from the fructification, very useful indications of the habit, which invention of the latter botanist was highly applauded by Linnæus.

Linnæus termed the full descriptions in his *Genera Plantarum*, the natural character of each genus. They ought to accord with every species of each, but in large genera, many species of which have been discovered subsequently to their establishment, this is scarcely possible. Such characters as serve merely to distinguish each genus from every other in its artificial order, in the Linnæan, or any other artificial, system, are called *substantive*; these are much better extended so as to include sufficient marks of discrimination between the genus under consideration and every other, and they then become the *essential* characters above-mentioned, which ought in every systematic botanical work to stand at the head of each genus, or at least to be indicated by a reference. Lamarck, though never disposed to criticise the great Swedish botanist, and differing totally from him respecting his opinion of natural genera, very candidly allows that "these essential characters are the result of one of Linnæus's most happy ideas, and cannot but contri-

bute greatly to the perfection of Botany." The same able writer assents entirely to the Linnæan maxim, founded on the good sense and penetration of Conrad Gesner, that "generic characters ought always to be taken from the parts of fructification alone;" "at least," says Lamarck, "if that be always practicable." When it is not, he would borrow characters from any thing very decided in the habit; nor does he perceive that any inconvenience would result from it. To this we object the uncertainty of such characters, even when taken from what is least exceptionable, the inflorescence. Of this no more striking example can be found than the *Umbellatæ*, as distributed by Linnæus after the principles of his friend Artedi, in which, however it may be disguised by sophistry, the inflorescence makes a leading part. Those who justly, like Lamarck, complain of the errors, unjustly termed by him *arbitrary* and *voluntary* errors, which are found in this part of Linnæus's system, cannot but allow that they all originate from his having had respect to the inflorescence, that is, to the umbels and involucrems, instead of the flowers and seeds, which if truly observed are fully sufficient in this, as, we believe, in every other natural order. Indeed the more we consider the subject, the more we are convinced that, although the inflorescence ought, like every part of a plant, to enter into our general contemplation before we decide upon a genus, it ought never to form a part of the technical or essential character. It is tempting enough to botanists who are not endowed with clear mathematical powers of discrimination and definition, to amplify their generic characters with any thing that, as they suppose, may give them additional strength. But characters, when too long, rather indicate feebleness in themselves and in their authors, and endanger a return towards barbarism in a science, which has been raised to its present pitch of perfection by the didactic precision and decisive brevity of Linnæus. S.

GENUS, *Kind*, in *Logic* and *Metaphysics*, is that which has several species under it; or it is the origin and radix of divers species, joined together by some affinity, or common relation between them. See CLASSIFICATION.

Genus is a nature, or idea, so common and universal, that it extends to other general ideas, and includes them under it. Thus, animal is said to be a genus, in respect of man and brute; because man and brute agree in the common nature and character of animal; so a right-lined figure of four sides is a genus in respect of a parallelogram, and a trapezium; and so, likewise, is substance in respect of substance extended, which is body; and thinking substance, which is mind.

A good definition, say the schoolmen, consists of genus and difference.

In the general, genus may be said to be a class of a greater extent than species; and which is not convertible therewith: for though we may say, that all body is substance; yet it cannot be said all substance is body.

Add, that whatever may be said of the genus may likewise be said of the species under it: *e. gr.* whatever is said of *ens*, being, will equally hold of the body.

The schoolmen define the *genus logicum* to be, an universal which is predicable of several things of different species; and divide it into two kinds: the one, the *summu*, which is the highest, or most general; and has nothing above it to respect as a genus: the other, the *subaltern*, which they likewise call a *diu*.

GENUS *summu* is that which holds the uppermost place in its class, or predicament; or that which may be divided into several species, each whereof is a genus in respect of other species placed below it.

Thus,

Thus, in the predicament of things subsisting of themselves, *substance* has the place and effect of *genus summum*, and is predicated of all the things contained in that class: for Plato, and man, and animal, and even spirit, are properly called substance.

Accordingly there are as many *summa genera*, as there are classes of predicaments, or categories.

**GENUS, subaltern**, is that which, being a medium between the highest genus and the lowest species, is sometimes considered as a genus, and sometimes as a species.

Thus, bird, when compared with animal, is a species; when to a crow, an eagle, or the like, it is a genus.

Genus, again, is divided into *remotum*, remote, where between it and its species there is another genus; and *proximum*, or next, where the species is immediately under it; as man under animal.

GENUS is also used for a character, or manner applicable to every thing of a certain nature or condition. In which sense it serves to make capital divisions in divers sciences; as music, rhetoric, botany, anatomy, &c. *c. gr.*

GENUS, in *Music*. See GENERA.

GENUS. By the word *genus*, in *Natural History*, we understand a certain analogy of a number of species making them agree together in the number, figure, and situation of their parts in such a manner, that they are easily distinguished from the species of any other genus, at least by some one article. This is the proper and determinate sense of the word *genus*, whereby it forms a subdivision of any class or order of natural beings, whether of the animal, vegetable, or mineral kingdoms, all agreeing in certain common and distinctive characters. See **GENERIC name**, and **CLASSIFICATION of Animals**.

GENUS, in *Rhetoric*, is one of the common places or topics, and contains under it two or more sorts of things differing in nature. From this head logicians reason thus: Because every animal is mortal, and man is an animal, therefore man is mortal (See GENUS, in *Logic*.) But orators make a further use of this argument, which they call ascending from the hypothesis to the thesis, that is, from a particular to a general. As if a person, speaking in praise of justice, should take occasion from thence to commend and shew the excellency of virtue in general, with a view to render that virtue more amiable. For since every species contains in it the whole nature of the genus to which it relates, besides what is peculiar to itself, whereby it is distinguished from it; what is affirmed of the genus must, of necessity, be applicable to the species.

Besides, authors distinguish the art of rhetoric, as also orations, or discourses, produced thereby, into three genera, or kinds; *demonstrative*, *deliberative*, and *judiciary*. See each term.

GENESIUM, in *Ancient Geography*, a town of Italy, in that part of Magna Græcia called Messapia. It was situated a little S. of the road that led to Tarentum.

GENZANO, in *Geography*, a town of Naples, in Basilicata; 12 miles E. S. E. of Venosa — Also, a town of Campagna di Roma, in Italy; 3 miles W. of Veletri.

GENZINGEN, a town of France, in the department of the Rhine and Moselle; 5 miles N. E. of Crenznach.

GEOCENTRIC, of  $\gamma\epsilon$ , *earth*, and  $\kappa\epsilon\upsilon\tau\rho\varsigma$ , *centre*, in *Astronomy*, is applied to a planet, or its orbit, to denote it concentric with the earth; or, having the earth for its centre, or the same centre with the earth.

All the planets are not geocentric: the moon, alone, is properly geocentric.

GEOCENTRIC *latitude* of a planet, is its latitude seen from the earth; or the inclination of a line connecting the planet

and the earth, to the plane of the earth's (or true) ecliptic.

Or it is the angle which the aforesaid line (connecting the planet and the earth) makes with a line drawn to meet a perpendicular let fall from the planet to the plane of the ecliptic. See **LATITUDE**.

Thus in *Plac. XII Astronomy*, fig. 116, the angle  $\angle T e$  is the measure of that planet's geocentric latitude: when the earth is in  $T$ ; and the angle  $\angle e t$  the measure of it when the earth is in  $t$ .

GEOCENTRIC *place* of a planet, is the place wherein it appears to us, from the earth, supposing the eye there fixed: or, it is a point in the ecliptic, to which a planet, seen from the earth, is referred.

GEOCENTRIC *longitude* of a planet, is the distance measured on the ecliptic, in the order of the signs between the geocentric place and the first point of Aries.

GEODÆSIA, that part of practical geometry which teaches how to divide, or lay out, lands, or fields, between several owners.

The word is Greek,  $\gamma\epsilon\omicron\delta\alpha\iota\sigma\iota\alpha$ , formed of  $\gamma\epsilon$ , *terra, earth*, and  $\delta\alpha\iota$ , *divido, I divide*.

GEODÆSIA is also applied, by some, to all the operations of geometry which are performed in the field.

This is more usually called *surveying*, (which see.) when employed in measuring of lands, grounds, roads, countries, provinces, &c.

Vitalis defines *geodæsia* the art of measuring surfaces and solids not by imaginary right lines, as is done in geometry, but by sensible and visible things: as by the sun's rays, &c.

GEODES, in *Natural History*, a genus of crusted bodies formed into large, and in great part, empty cases, including a small quantity of earthy or arenaceous matter. See **SIDEROCHITA**.

Of this genus are five known species.

GEOFF, in *Rural Economy*, a term provincially applied to a mow of hay, corn, &c. See **STACK**.

GEOFFRÆA, in *Botany*, so named by Jacquin, in memory of Stephen Francis Geoffroy, M. D. of Paris, author of a *Materia Medica*, in which a chemical analysis is given, to little purpose indeed, of every officinal plant; and of several ingenious chemicobotanical essays in the *Memoires de l'Acad. des Sciences*. Jacquin seems to confound him with his brother Claude Joseph Geoffroy, author of an essay on the structure and use of the principal parts of flowers, and of some other physiological papers, printed in the same *Memoires*. — Jacq. Amer. 207. t. 180. f. 62. Linn. Gen. 378. Schreb. 500. Willd. Sp. Pl. v. 3. 1129. Mart. Mill. D. & v. 2. Juss. 363. Lamarck Illustr. t. 604 — Class and order, *Dizelphia Decandria*. Nat. Ord. *Papilionacea*, Linn. *Leguminosæ*, Juss.

Gen. Ch. Cal. Perianth of one leaf, inferior; bell-shaped; five-cleft half way down; its two upper segments diverging, spreading. Cor. papilionaceous; standard roundish, emarginate, flat; reflexed; wings equal to it in length, obtuse, concave; keel compressed, the length and shape of the wings. Stam. Filaments in two sets (single and nine-cleft), the length of the keel; anthers roundish. Pist. Germen superior, roundish; style awl-shaped; stigma obtuse. Peric. Drupa nearly ovate, large, with a longitudinal furrow at each edge. Seed. Nut nearly ovate, somewhat woody, a little compressed, with a furrow along each edge, acute, of two valves.

Eff. Ch. Calyx five-cleft. Drupa ovate. Nut compressed. 1. *G. spinosa*. Linn. Sp. Pl. 1043. Swartz. Prod. 106.

(Unari,)

(Umari; Marcgr. Bras. 121.)—"Spinous. Leaflets oblong, obtuse."—Native of Brazil, and the country about Carthage, in woods on a sandy soil near the sea. Jacquin describes it as an elegant tree, twelve feet high, with a few spines on the trunk and larger branches, which are awl-shaped, and generally an inch long. *Leaves* pinnate, about seven pair, with an odd one, of oblong, obtuse, smooth, entire leaflets, on a stalk four inches in length. *Clusters* nearly as long, axillary, simple, dense. *Flowers* on short partial stalks; their colour a dirty orange, and their scent extremely powerful and offensive. *Fruit* like that of an almond in its coat, slightly downy, greenish-yellow; the pulp soft, sweet, but of a nauseous smell, yellowish, staining the hands with a rusty hue, very difficult to wash off. This coat adheres firmly to the nut, whose kernel is white, mealy and astringent. Jacquin was justly surprised at meeting, for the first time, with a drupa to a papilionaceous flower, but he justly so named it, in spite of any preconceived theory.

2. *G. furinamensis*. Willd. n. 2. Bondt. Monogr. 13, with a figure—"Without spines. Leaflets oblong, obtuse, emarginate."—Native of Surinam. *Willdenow.*

3. *G. inermis*. Swartz. Prod. 106. Woody. Med. Bot. t. 112. (Cabbage-bark tree of Jamaica; Wright in Phil. Transf. v. 67. 507. t. 10.)—"Without spines. Leaflets lanceolate."—Native of Jamaica and Martinico. A tall tree, whose wood is white, and so tough as to be preferred beyond all others for the shafts of carriages. The bark is a celebrated remedy for worms in the intestines, administered in a decoction, syrup, powder, or extract, and given in gradually increased doses, till a nausea is produced. The leaves consist of five or six pair, with an odd one, of elliptic lanceolate, pointed leaflets, about three inches long. *Flowers* light-red, in very large much-branched, terminal, downy panicles. *Fruit* the size of a small plum.

GEOFFREYA, or GEOFFROYA, *inermis*, cabbage-bark tree, or worm-bark tree, in the *Materia Medica*, is a native of Jamaica. (See the preceding article.) The bark of this tree, which has a mucilaginous and sweetish taste, and a disagreeable smell, was first noticed as a vermifuge by Mr. Peter Duguid (Ess. and Obs. Physic. and Liter. vol. 2. page 264.) But the fullest information concerning this tree, in respect to both its medical and botanical characters, has been communicated by Dr. Wright, who resided a long time in Jamaica. According to his account, the bark of this tree is powerfully medicinal, and its anthelmintic effects have been established in Jamaica by long experience. It may be given in different forms, as in decoction, syrup, powder, and extract; and the manner of preparing, and exhibiting these, are particularly stated by Dr. Wright. For the *decoction*, take fresh dried or well-preserved cabbage-bark, one ounce: boil it in a quart of water, over a slow fire, till the water is of an amber colour, or rather of a deep-coloured Madeira wine; strain it off, sweeten it with sugar, and let it be used immediately; as it does not keep many days. In order to obtain the *syrup*, add a double portion of sugar to any quantity of the above decoction. This syrup will retain its virtues for years. The *extract* is made by evaporating the strong decoction in *balneo marie* to the proper consistence; it must be continually stirred, as otherwise the resinous part rises to the top, and on this, probably, its efficacy depends. The *powder* of well dried bark is easily made, and looks like jalap, though not of equal specific gravity. As this anthelmintic has also a narcotic effect, it is proper to begin with small doses, which may be gradually increased till a nausea is excited, when the dose for that patient is ascertained. A strong healthy grown person may at first take four table-spoonfuls of the decoction

or syrup, three grains of the extract, or thirty grains of the powder for a dose. The dose must be diminished for younger persons; and children two or three years of age, may take a table-spoonful of the decoction or syrup, one grain of extract, or ten grains of the powder; and children of a year old, half the quantity. Cold water must not be drank during the operation of the medicine, as it is apt to occasion sickness, vomiting, fever, and delirium. In this case the stomach must be washed with warm water, castor oil must be administered, and lime juice beverage used plentifully for common drink. The bark purges pretty briskly, especially in powder; thirty or forty grains working as well as jalap by stool; but in this mode of administering it, it does not seem to kill worms so well as in decoction. The cabbage-bark is a valuable remedy when used with proper caution; but some fatal accidents have attended the imprudent use of it, chiefly from overdosing the medicine. Phil. Transf. vol. lxxvii. p. 597.

GEOFFREY of Monmouth, in *Biography*, an early historian of our own country, who flourished about the middle of the 12th century, was first archdeacon of Monmouth, and then bishop of St. Asaph. On account of tumults in Wales he quitted his diocese, and obtained the abbacy of Abingdon in commendam. His clergy applied to him to return, which he refused, thinking he might still keep his abbacy; in this he was disappointed, and was left without any preference. As an historian he is known by his "*Chronicon five Historia Britonum.*" This work has been censured for its fabulous narrations; the author is, however, entitled to much applause as a polite scholar. His Latin style rises greatly above mediocrity. He was author of many other pieces, among which is a poem on Merlin, which is much commended by Leland. The *Chronicon* is supposed to be translated from an ancient history in the Welsh language, and it contains a pretended genealogy of the kings of Britain, from the time of Brutus the Trojan, and enumerates upwards of seventy illustrious monarchs before the invasion of Julius Cæsar. This work has been frequently reprinted. Bayle. Moreri. New Annual Register, vol. iv.

GEOFFROY, ETIENNE FRANÇOIS, a physician, was born at Paris on the 13th of February, 1672. His father was an apothecary, and had held the offices of sheriff and consul. While the young Geoffroy was pursuing his studies under his paternal roof, his father held regular scientific meetings, at which Cassini attended with his planispheres, Sebastian with his machines, and Joblot with his magnets, and at which Du Verney performed his dissections, and Homberg his chemical experiments. After an excellent foundation of general science was thus laid, his father sent him, in 1692, to Montpellier, to study his own profession of pharmacy under an experienced apothecary. Here he attended the courses of the most celebrated professors of the university, and afterwards travelled through the southern provinces before he returned to Paris. Already he had acquired considerable reputation; and, although not yet a physician, he was appointed to accompany the duke de Tallard, as his medical attendant, on his embassy to England, in 1698. In London he was much esteemed by sir Hans Sloane, and other men of science, and was elected a member of the Royal Society. From England he went to Holland; and afterwards to Italy in 1700, with the abbé de Louvois. Natural history and the materia medica were among the principal objects of his enquiries; for his father intended him for his successor in his establishment at Paris; but he aimed at the higher walk of the profession, and with the consent of his father at length took the degree of bachelor in 1702, and that of doctor in 1704. His disposition was



kind and kind to his patients, who, on his outset in practice, were alarmed by the solemn air which his sympathy for their sufferings occasioned him to assume; but his reputation soon increased, and he was called in consultation even by the most distinguished members of the profession. In 1709, he was appointed by Louis XIV. to the professorship of medicine, vacant by the death of Tournefort. In his new office he undertook to deliver to his pupils a complete history of the materia medica, upon which subject he had been for a long time collecting information. He completed his account of the *mineral* substances employed in medicine, of which he gave a most correct and ample history; and was employed on the *vegetable* kingdom, which he treated alphabetically, and carried no farther than the article *Melissa*: on the *animal* kingdom he had not touched; but the whole of what he had delivered in his lectures was found among his papers in good order, and afterwards published. In 1712, he succeeded Fagou as professor of chemistry in the king's garden. In 1726, he was elected dean of the faculty, in the exercise of the functions of which he was led into some active and anxious disputes, which, together with the duties of his profession, and of his other offices, destroyed his health, which was naturally very delicate. He lingered from the beginning of the year 1730 till the 6th of January, 1731, when he died. Notwithstanding his malady, however, he had the resolution to complete a work, which had been deemed necessary by preceding deans, but never accomplished; namely, a pharmacopeia, containing a collection of the compound medicines requisite to be kept by apothecaries, "Le Code Medicamentaire de la Faculté de Paris," of which two editions, enlarged and corrected, were afterwards published. His papers on the materia medica were published under the following title: "Tractatus de Materia Medica, sive, de Medicamentorum simplicium historia, virtute, delectu, et usu," Paris 1741, 3 vols. 8vo. under the inspection of Antoine de Jussieu. Several editions have been subsequently published. It was translated into French by Ant. Bergier, who published 7 vols. 12mo. in 1743, and the remainder in 3 vols. in 1750. Arnault de Nobleville, and Salerne, physicians of Orleans, published a continuation of this work, under the title of "Histoire Naturelle des Animaux," Paris 1756, 1757, in 6 vols. 12mo, which is deemed not unworthy to be ranked with the production of Geoffroy. Eloy. Dict. Hist.

**GEOGLOSSUM**, in *Botany*, from  $\gamma\lambda\omega\sigma\varsigma$ , the *earth*, and  $\gamma\lambda\omega\sigma\varsigma$ , the *tongue*. Perfoon Syn. Fung. 607. Class and order, *Cryptogamia Fungi*. Nat. Ord. *Fungi*.—Sect. *claviformes*.

Eff. Ch. *Receptacle* club-shaped, fleshy, generally compressed, short, with a prominent margin next to the stalk.

This genus of *Fungi* is founded by Perfoon on the *Clavaria ophioglossoides* of other authors, with some different species which resemble it, and which have the appearance of a little tongue, growing out of the earth upon a stalk. He enumerates and defines seven species. His *G. hirsutum* is *Clavaria ophioglossoides* of Sowerby's *Fungi*, t. 83; his *G. glabrum* is a smaller and smooth fungus, very like the fruitifying spike of the fern *Ophioglossum*, except in being nearly black.

**GFOGNOSY**. See **GEOLOGY** and **MINERALOGY**.

**GEOGRAPHICAL MILE** is a minute, or the sixtieth part of a degree of a great circle. See **DEGREE** and **MILE**.

**GEOGRAPHICAL Table**. See **MAP**.

**GEOGRAPHY**, formed of  $\gamma\epsilon$ , *terra*, *earth*, and  $\gamma\gamma\alpha\gamma\alpha$ , *scribo*, *I write*, *I describe*; the doctrine or knowledge of the earth, both as in itself and as to its affections; or a description of the terrestrial globe, and particularly of the known

habitable part thereof, with all its subordinate divisions. Geography constitutes a branch of inathematic, of a mixed kind; because it considers the earth, and its affections, as depending on quantity; and consequently, as measurable: *viz.* its figure, place, magnitude, motion, celestial appearances, &c. with the several circles imagined on its surface.

Geography is distinguished from *cosinography*, as a part from the whole; this latter considering the whole visible world, both heaven and earth.

From topography and chorography, it is distinguished, as the whole from a part.

Golnitz considers geography as either *exterior* or *interior*; but Varenius more justly divides it into *general* and *special*: or *universal* and *particular*.

**GEOGRAPHY, general or universal**, is that which considers the earth in general, without any regard to particular countries, or the affections common to the whole globe; as its figure, magnitude, motion, land, sea, &c. And this may be subdivided into *absolute* geography, which respects the body of the earth itself, its parts and peculiar properties, &c.; *relative*, which accounts for the appearance and accident, owing to celestial causes; and *comparative*, which explains those properties that arise from comparing different parts of the earth together.

**GEOGRAPHY, special or particular**, is that which considers the constitution of the several particular regions, or countries, their bounds, figure, &c. with the mountains, forests, mines, waters, plants, and animals, &c. therein; as also their climates, seasons, heat, weather, distance from the equator, &c. and their inhabitants, arts, foods, commodities, customs, language, religion, policy, cities, &c.

Special geography may be subdivided, with regard to the several periods of its progress, into *ancient*, including a description of the earth, conformably to the knowledge which the ancients had till the decline of the Roman empire; of this kind Cellarius's *Ancient Geography* is an excellent summary: the geography of the *mean age*, which extended from the fall of the Roman empire to the restoration of learning; and *modern* geography, comprehending the actual description of the earth since that time. With regard to its objects and uses, special geography may be divided into *natural*, which treats of the divisions and distinctions which nature has made in the surface of the globe, and the complexion, language, &c. of its inhabitants; *historical*, comprehending the different revolutions which any country or town has undergone; *civil*, or *political*, including the government of any country; *sacred*, describing those countries and places that are mentioned in scripture and ecclesiastical history; *ecclesiastical*, giving an account of the ecclesiastical jurisdiction established and exercised in various countries; and *physical*, which considers not only the surface of the globe, but also its intrinsic nature and substance. Geography is very ancient, at least the special part thereof; for the ancient writers scarcely went beyond the description of countries. Of this kind is the geography which we find in the books of Moses, written about the year 1452 B. C. and that of Homer, in his *Iliad* and *Odyssey*, who flourished, according to the Arundelian marbles, 907 years B. C. The geographical knowledge we derive from Herodotus, who flourished about 445 years B. C., is very partial and imperfect. It chiefly relates to certain parts of Asia, and divers others unknown, as well as the northern and western parts of Europe; and also Africa, Egypt and Lybia excepted.

It appears (see *Ptol. Geog. l. i. c. 9.*) that the early geographers, being destitute of mathematical in-

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struments and of astronomical observations, began first to determine the situation of places according to climates; and they were led to fix upon these climates from the form and colour of certain animals which were to be found in those different countries. The appearance of negroes, or of those called by them Ethiopians, and of animals of the larger size, such as the rhinoceros and elephant, suggested to them the line of division, where the limits of the Torrid Zone began towards the north, and terminated towards the south. This grosser manner of dividing their climates must be considered as the first rude outline of geography in the more illiterate ages of the world. However this be, the Chaldeans and Egyptians, who were distinguished by their skill in geometry and astronomy, were of course the first persons that paid any particular attention to geography; and it is said that the first map was made by order of Sesostris I. who conquered Egypt.

This Egyptian king, says Eusebius in his epistle, prefixed to his commentary on Dionysius's *περιηγησις*, having traversed great part of the earth, recorded his march in maps, and gave copies of his maps not only to the Egyptians, but to the Scythians, to their great astonishment. The Jews also seem to have had surveyors among them; and hence some have imagined that they had made a map of the Holy Land, when they gave the different portions to the nine tribes at Shiloh. (Josh. xviii. 4. 8. 9.) And Josephus tells us (l. v. c. 1.), that when Joshua sent out people from the different tribes to measure the land, he gave them as companions persons well instructed in geometry, whose skill would prevent their deviating from the truth. We may therefore reasonably presume that a geometrical survey was then made of the Holy Land; though we cannot absolutely determine whether their mensuration was only taken down in numbers, or regularly projected and digested into a map.

Besides the method of dividing countries by climates, already mentioned, the Egyptians and Babylonians adopted another, which was that of determining the situation of places, or their distance from the equator, by observing the length of their longest and shortest days. This they performed by means of a gnomon, erected upon a horizontal plane, by which they were enabled to measure the length or shortness of the shadow in proportion to the height of the gnomon. For an account of this invention, and of the method of applying it, see GNOMON.

From the days of Thales, and his immediate successors, who flourished in the sixth century before Christ, geography seems to have received little improvement for 200 years, till the establishment of the famous school of Alexandria; although Pythagoras and his disciples were rightly informed with regard to the true system of the world, as they placed the sun in the centre, and ascribed to the earth both its diurnal and annual revolutions. During this period we have an astronomical observation of considerable importance to geography, and the first Greek observation upon record; which is that of Meton and Euctemon, who observed the summer solstice at Athens on a day corresponding to the 27th of June, 432 years B. C. This solstitial observation must have given them an opportunity of determining the latitude of Athens at the same time, if they had known the simple manner of deducing the conclusion: for as the length of the shadow of the gnomon was attentively watched at the moment of the solstice, the proportion of that to the gnomon's height was easily known, by which the angle of the sun's altitude would be given; and though the sun's greatest declination was not then accurately known,

yet still the latitude of Athens might have been determined within the limitations of the error respecting the declination. We have reason to believe that Timocharis and Arifillus, who began to observe 295 years B. C., were the first who introduced the manner of determining the position of the stars, according to their longitudes and latitudes taken with respect to the equator. This we know from Ptolemy, who has preferred many of their observations in his "Almagest;" and particularly one, which gave rise to the famous discovery of the *Precession of the Equinoxes*: which see. It was after the precession of the equinoxes was fully established by Ptolemy, that the longitudes and latitudes of the stars were uniformly referred to the ecliptic instead of the equator. It was therefore, by an easy transition, that Hipparchus would be led to assort and dispose the different parts of the earth according to latitude or longitude: this being only a new application or transposition of that artifice, which had been already so happily introduced in the arrangement of the constellations, and therefore equally proper to be adopted in tracing the meridians and parallels of the earth. Hipparchus must be universally allowed to have first fixed the solid foundation of geography by uniting it to astronomy, and thus rendering its principles self-evident and invariable.

Pliny (N. H. l. ii. c. 12.) confirms this, when, after mentioning Thales and Sulpicius Gallus, who had both predicted eclipses, he adds, "that Hipparchus had foretold the revolution (of the eclipses) of the sun and moon for 600 years, comprehending the months, days, and hours of different nations, and the situation of places," by which it would seem that the latitudes and longitudes of these places were particularly given. But the fullest and strongest authority for appropriating this invention to Hipparchus, is that of Ptolemy in his "Geography," (l. i. c. 4.) who says, "that Hipparchus was the only author who had given the elevations of the north pole of a few cities, in proportion to the great number that were to be delineated, and such too as lay under the same parallels, &c. &c." And yet it is somewhat remarkable that though latitudes and longitudes were in this manner introduced and pointed out by Hipparchus, yet they were so little attended to till the days of Ptolemy, that none of the intermediate authors, such as Strabo, Vitruvius and Pliny, all of whom minutely described the geographical situation of places according to the length and shadows of the gnomon, have ever given us the least hint of the latitude or longitude of any one place whatever in the language of degrees and minutes.

When the true principles of geography were thus pointed out by this new invention of latitude and longitude, it was no wonder that maps were from thence made to assume a new form of projection essentially different from those in use prior to this period. For the history of the construction of maps, see MAP.

It was a constant custom among the Romans, after they had conquered and subdued any province, to have a map, or painted representation thereof, carried in triumph, and exposed to the view of the spectators. Thus the Romans, as they were the conquerors, became the surveyors of the world. Every new war produced a new survey and itinerary of the countries where the scenes of action occurred; so that the materials of geography were accumulated by every additional conquest. Polybius, (l. 3. p. 123. ed. Casaub.) when he tells us, that at the beginning of the second Punic war, Hannibal was preparing his expedition against Rome, by crossing from Africa into Spain, and so through Gaul into Italy, says, "that all these places were

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were measured or surveyed with the utmost care by the Romans."

Vegetius De Re Mil. (l. iii. c. 6.) has well described the surveys of particular provinces, with which every Roman general was regularly furnished before his march. Æthicus, in the preface to his "Cosmographia," further informs us, that Julius Cæsar ordered a general survey to be made of the whole Roman empire by a decree of the senate: selecting for this purpose persons well instructed in every branch of philosophy. The three surveyors were Zenodorus, Theodorus, and Polychius, each of whom was appointed to survey a different division of the empire. This survey commenced in the consulship of Julius Cæsar and Marc Antony, in the year 44 B. C., and continued for twenty-five years one month and ten days, to the consulship of Sestius Saturninus and Lucrotius Cinna, in the year 19 B. C. The Roman itineraries that are still extant, evidently shew with what accuracy their surveys were made in every province; and Pliny has filled the 3d, 4th, and 5th books of his Natural History with the geographical distances that were thus measured.

Before the Romans engaged in this business, Neco, king of Egypt, ordered the Phœnicians to make a survey of the whole coast of Africa; which they accomplished in three years: Darius procured the Ethiopic sea, and the mouth of the Indus, to be surveyed. Thales of Miletus, Anaximander his disciple, who is said to have constructed the first map; Democritus, Eudoxus, &c. who made the use of maps common in Greece; Aristagoras of Miletus, who presented to Cleomenes, king of Sparta, a table of brass, on which he had described the known earth, with its seas and rivers; and other Greeks, availing themselves of the assistance derived from the Chaldeans and Egyptians, prosecuted the study and enlarged the extent of this science. It appears that in the time of Socrates geographical maps were used at Athens; for this philosopher humbled the pride and boast of Alcibiades, by desiring him to point out his territories in Attica in a map; and Pliny relates, (l. vi. c. 17.) that Alexander, in his expedition into Asia, took two geographers, Diognetus and Berton, to measure and describe the roads, and that from their itineraries the writers of the following ages took many particulars. Indeed, this may be observed, that whereas most other arts are sufferers by war, geography and fortification have been improved thereby. We also learn from Strabo, that a copy of Alexander's survey was given by Xenocles, his treasurer, to Patrocles the geographer, who, as Pliny informs us, was admiral of the fleets of Seleucus and Antiochus. His book on geography is often quoted both by Strabo and Pliny: and it appears that this author furnished Eratosthenes with the principal materials and authorities for constructing the oriental part of his map of the then known world. For the voyages of Patrocles under Seleucus, upon the Caspian sea, and elsewhere, were a kind of supplement to those measurements given by Berton and Diognetus already mentioned, and by Nearchus and Onesicritus, the two admirals who were employed under Alexander, and therefore Pliny quotes them immediately after. It appears likewise from the same passage, that Megasthenes and Dionysius were two surveyors sent into India by Ptolemy Philadelphus, for the purposes of geography: and their authority was sometimes set in opposition to Patrocles by Hipparchus, in his criticism upon Eratosthenes's geography. (Strabo, lib. ii. passim.) From the memorable era of Alexander's expedition and conquest, and those of his immediate successors, geography began to assume a new face and form. For Eratosthenes, who is dis-

tinguished himself by the cultivation of the science of geography. (See the article ERATOSTHENES.)

We shall now recite the names of some of the principal persons who have contributed to the improvement of geography. Pytheas, the famous geographer of Marseilles, flourished in the time of Alexander; and Aristotle seems to have been no less conversant with geography than philosophy: after Alexander, Seleucus Nicanor, Theophrastus the disciple of Aristotle, Eratosthenes, who published three books of geographical commentaries, and corrected a chart of Anaximander, Hipparchus, who corrected the observations of Eratosthenes, and thus furnished occasion for a dispute which greatly contributed to the improvement of geography, Agatharcides of Cnidus, who lived under Ptolemy Philometor, and Mæsius, who, about fifty years after him, published a description of the whole world, Artemidorus of Ephesus, who gave a description of the earth in eleven books, often cited by Strabo and Pliny, and many others, whose names it would be tedious to enumerate, distinguished themselves by the cultivation and improvement of this science. Geography was transmitted, with the other arts, from Greece to Rome, as we have already mentioned. Varro's works contain many geographical remarks: Zenodorus, Theodorus and Polychius were employed under the consulship of Julius Cæsar and Marc Antony, in surveying and measuring the globe. (See the preceding part of this article.) The commentaries of Cæsar are well known. Ptolemy encouraged Poidonius, who made an imperfect mensuration of the earth by celestial observations, in different places under the same meridian. (See DEGREE). Augustus was a distinguished patron and promoter of this science; under whom Strabo published his geography. And the taste for the study and advancement of geography was greatly encouraged under Tiberius, Claudius, Vespasian, Domitian, and Adrian. Hydore of Charax, who lived to the commencement of the first century of the Christian era; Pomponius Mela, who published a book entitled "De Situ Orbis;" Metius Pomponianus, who, having depicted the earth on a parchment, fell a sacrifice to the jealousy of Domitian, the emperor suspecting that he aimed at the empire; Pliny the naturalist, who has described the countries known in his time in the third, fourth, fifth and sixth books of his Natural History; Marinus the Tyrian, who corrected and enlarged the discoveries of preceding geographers; and the emperor Antoninus, deserve particular mention. This abstract of the history of ancient geographers, notwithstanding whose successive labours geography was still in a very imperfect state, brings us to a period, about the 150th year of the Christian era, in which Ptolemy of Alexandria contributed greatly to the improvement of this science, by a more ample and accurate description of the terrestrial globe than any had yet given of it. He availed himself of numerous observations and ancient charts; he corrected the mistakes and supplied many defects of others; and by reducing the distances of places on the earth to degrees and minutes, after the manner of Poidonius, making use of the degrees of longitude and latitude, and settling the situation of places by astronomical observations, he reduced geography into a regular system, and laid a foundation for those farther discoveries and improvements, which naturally resulted from the progressive, and at present advanced state of geometry, astronomy, navigation, and commerce.

In order to form a proper judgment of the benefits according to geography from the labours of Ptolemy, we ought to take into account the materials that were extant in his

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time, and which he had actually in his possession. These consisted of various particulars, some of greater and others of a less degree of authenticity. The principal were the "proportions of the gnomon" to its shadow, taken by different astronomers at the times of the equinoxes and solstices; "calculations" founded upon the length of the longest days; "the measures" or computed distances of the principal roads contained in their surveys and itineraries, and the various "reports of travellers and navigators," who often determined the intervals of places by hear-say and guess-work. All of these were to be compared together, and digested into one uniform body or system, and after this, were converted and translated by him into a new mathematical language, expressing their different degrees and minutes of latitude and longitude, according to the invention of Hipparchus, but which Ptolemy had the merit of carrying into full practice and execution, after it had been neglected for upwards of 250 years. We have no reason to suppose, that Ptolemy had in his possession real astronomical observations sufficient to determine all the longitudes and latitudes which he has given; so that we ought always to remember, that their degrees of accuracy depended upon the veracity of the fact or suggestion communicated to him, from which they were afterwards deduced. We have therefore no reason to be astonished at the multitude of errors that are to be found in it, when his original materials were so imperfect for executing so large a work, as that of fixing the longitudes and latitudes of all the places, coasts, bays, and rivers of the then known world; an undertaking which, even in our days, has not hitherto been brought to any sufficient degree of accuracy. The mistakes of Ptolemy ought to be regarded with candour, as they arose from the ignorance of the age in which he lived, which could give him no better information, and not from ignorance or inattention on his own part. Nevertheless, Ricciolus, Cellarius, Paul Merula, and Salmassius have been too severe in their criticism and censures; as if they were disappointed in not seeing this science in its full maturity in the writings of Ptolemy, at a time when it was evidently but just beginning to advance beyond the verge of its earliest infancy. They might with equal justice condemn the modern geographers for giving no better account of Nova Zembla, or New Holland, or of those continents and islands that lie on the northern or southern extremities of the great South sea towards the two Poles; of which the knowledge which they could obtain was very imperfect. The principal mistakes in Ptolemy took their rise from certain astronomical observations and surveys, which were supposed to have been made with accuracy in a prior age, and which were adopted by this great geographer as genuine; and they have been, for want of better information, copied by succeeding geographers and inserted in their maps, as being, in their opinion, of acknowledged and undoubted authority. These mistakes, thus introduced, maintained their places in all maps, by a kind of unquestioned prescription, even to the commencement of the last century, and it unfortunately happened that these errors related to that part of the world which was best known to the ancient Greeks and Romans. Thus, Ptolemy states the latitude of Byzantium to be  $43^{\circ} 5'$  instead of  $41^{\circ} 1'$ , the latitude according to modern observations. In this particular Ptolemy was misled by Hipparchus, who is mentioned by Strabo (l. i.) as having visited Byzantium, and made this observation in person. The latitude of Marseilles, which was supposed to be under the same parallel with Byzantium, was not, however, so much mistaken, as by modern observations it has been found to be  $43^{\circ} 17' 45''$ ; and allowance being made for the now acknowledged diminution of the obliquity of the

ecliptic, (see ECLIP TIC,) the result will be nearer the truth. Another error of Ptolemy relates to the latitude of ancient Carthage, which he has placed in  $32^{\circ} 20'$  instead of  $36^{\circ} 52'$ , the true latitude according to the best observations. This erroneous latitude seems to have been copied or translated from a passage in Strabo (l. ii.), in which it is stated that at Carthage the gnomon has the same proportion to the equinoctial shadow, which 11 has to 17, whence by plain trigonometry we shall have the latitude of  $32^{\circ} 28'$ , very near that of Ptolemy. The third capital mistake of Ptolemy relates to the length of the Mediterranean, which is generally measured from the straits of Gibraltar to the bottom of the bay of Issus, where Alexandretta, or Scanderoon, now stands, whose ancient name was Alexandria ad Issum. The difference of longitude of Alexandria ad Issum and Gibraltar, according to Ptolemy, is  $62^{\circ} 0'$ ; whereas the difference of longitude between these two places, according to the latest observations, is  $41^{\circ} 28'$ , and Ptolemy's error is  $20^{\circ} 32'$ . This error, which continued in all our maps, more or less, till the beginning of the last century, took its rise from the supposed surveys of persons of reputation, recorded by Strabo. (See DEGREE, EARTH, and LONGITUDE.) But to return from this digression:—many valuable geographical works appeared under Dioclesian, Constantius, and Maximian, &c. Under the emperor Theodosius the provincial and itinerary chart or table, since known under the name of Peutinger, was digested and formed; and the last work, that ought to be classed with those of the ancients, was the *Notitia Imperii*, attributed to Æthicus, who lived between the years 400 and 450 of the Christian era. The ages of barbarism succeeded the fall of the Roman empire; and the arts and sciences were obliged to seek refuge and protection from the Arabians and Orientalists in Asia; the principal of whom, distinguished by their attention to geography, were Almamom, caliph of Babylon, and Abulfeda, a Syrian prince. (See DEGREE.) After the revival of learning in Europe, and particularly during the two last centuries, geography has derived very considerable accessions from travels, voyages, and a variety of nautical and astronomical observations.

The great misfortune of ancient geography, and which indeed confined it to such a lingering state of infancy, was, that the true method of determining with accuracy the difference of longitudes was a matter of such difficulty, and remained so long unknown. One of the first attempts to rectify the length of the Mediterranean was made under the auspices of M. de Peirelk in 1635; and he also, with a direct view of correcting the errors in the longitudes of different places, took particular pains to get observations made at Marseilles, Aleppo, and Grand Cairo, of an eclipse of the moon, which happened August the 27th 1635. Before that time the difference of longitude between Marseilles and Aleppo had been supposed to be  $45^{\circ}$ , but by these observations it was found only to amount to  $30^{\circ}$  (the real difference has been since found to be  $31^{\circ} 58'$ ); so that by this a very considerable correction was made in the length of the Mediterranean, by taking off the difference of one whole hour, or  $15'$ , at once. About this time eclipses of the sun and moon were thought sufficient to determine the longitudes of all places with a tolerable accuracy. But, in the event, the ablest astronomers soon found that from these eclipses, however carefully observed, no clear deduction could be made of the longitude of any one place to any sufficient degree of exactness. Hence several eminent astronomers, such as Fournier, Kircher, and even Ricciolus, who had collected the observations of no less than 56 eclipses of the sun and moon, between the years 1560 and 1658, gave up

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the correction of geography by the application of eclipses of the sun and moon alone, as a fruitless and desperate undertaking. At length recourse was had to the eclipses of the satellites of Jupiter, and they were found effectual for the purpose. It was some time, however, before the theory of the secondary planets was regularly reduced to tables; and though Simon Marius first, and after him Baptista Hodierna, composed ephemerides of their motions, yet nothing of that sort was found to be sufficiently accurate for the purposes of longitude, till M. Cassini published his tables of the revolutions and eclipses of the satellites in 1668. The first opportunity of effectually applying this theory to the rectifying of geography was suggested by M. Cassini, and taken by M. Picard in 1671 and 1672, who, at the observatory of Tycho Brahe at Uraniborgh, observed two immersions and three emersions of the first satellite of Jupiter, which were afterwards compared with the same observed by M. Cassini at the observatory at Paris. This first experiment gave at once the difference of longitude in the clearest manner beyond the possibility of a doubt; and it likewise afforded the certain prospect of rectifying the whole extent of geography as to longitude, upon principles that were self-evident, and not liable to any mistake whatever. In consequence of this success, M. Picard and M. De la Hire, were immediately employed in correcting the map of France; in doing which they were obliged to contract it every where within less boundaries than it was supposed, according to their former maps, to have occupied; inasmuch that Lewis XIV. jocosely said, that he found by their journey he had suffered a loss of part of his kingdom. Other academicians determined by the same method the longitude of the isle of Gorée, near cape Verd, on the coast of Africa, and of Guadalupe and Martinico in the West Indies. And when M. Cassini had corrected his tables of the satellites of Jupiter, and published a new edition of them in 1693, M. Chazelles was sent up the Levant, to observe the longitudes and latitudes of Scanderoon, Alexandria, and Constantinople, in order to determine the length and breadth of the Mediterranean, which he executed with great ability.

Since the correction of longitudes has been introduced by means of the satellites of Jupiter, other methods have been also adopted and devised, which are proper and effectual for that purpose; such as "the transits of Mercury and Venus" over the body of the sun; "occultations" of the fixed stars by the moon; and since the lunar tables have been improved by M. Mayer and others, another mode, equally applicable to this important object, has occurred, by measuring from time to time the exact "distances of the moon from the sun," and "from a fixed star" of the first and second magnitude. In this mode there is a limitation of error, which so far gives a degree of satisfaction, and prepares the way for bringing the point that is thus unsettled to a more speedy and certain determination. Instruments of observation have also been improved; and time-pieces have been constructed, free in a great degree from the error and uncertainty of those that were formerly in use. See CHRONOMETER and CLOCK. See also EPHEMERIS and LONGITUDE.

For a fuller account of the history of ancient geography, see the preface to Bertius's edition of Ptolemy's *Theatrum Geographicum Veteris*, fol. For a brief history of the rise and progress of geography, see Varenus's *Geog.* and the Introduction to Elair's *Tables of Chronology*.

The art, however, must needs have been exceedingly defective; as a great part of the globe was then unknown: particularly all America, the northern parts of Europe and Asia, with the Terra Australis, and Magellanica; and as

they were ignorant of the earth's being capable of being failed round, and of the torrid zones being habitable, &c.

The principal writings on this art, among the ancient, are Ptolemy's eight books; among the moderns are, Johannes De Sacrobosco *De Sphæra*, with Clavius's comment; Ricciolus's *Geographia* and *Hydrographia Reformata*; Weigelius's *Speculum Terræ*; Dechales's *Geography*, in his *Mundus Mathematicus*; and above all, Varenus's *Geographia generalis*, with Jurin's additions; to which may be added, Leibnecht's *Elementa Geographiæ generalis*; Scurmius's *Compendium Geographicum*; Wolfius's *Geographia*, in his *Elementa Mathematicæ*; the preface to M. Robur's *Atlas*; the introduction to Butechius's *Geography*; the works of Duval, Briet, Delisle, D'Anville, Bonne, Brache, Mentelle, the Sanfons, Homann Morvilliers, Martiniere; Pinkerton's *Geography*, Gordon's, Salmon's and Guthrie's *Grammars*, &c. Hornii *Orb. ant. delineatio*, Claverius, Cellarius, Pomp. Mela, &c. &c.

The reader will find under the appropriate terms in this Cyclopædia, such information concerning the subjects which they express, as is consistent with the nature and limits of the work; and it would be, therefore, altogether superfluous to detail them in this place, and, in so doing, to transcribe articles that will be found in their proper places. See ALTITUDE, AMPHISCII, ANTIPODES, ANTECI, CIRCLES, CLIMATE, COLURES, DEGREE, EARTH, ECLIPTIC, EQUATOR, EQUINOCTIAL, GLOBE, HETEROSCHII, HORIZON, LATITUDE, LONGITUDE, MAP, MERIDIAN, MOUNTAIN, OCEAN, PARALLELS, PERILCI, PERISCHII, POLE, SPHERE, *Sphære* OBLIQUE, PARALLEL, and RIGHT, TROPICS, ZONES, &c. &c. &c.

**GEOLOGY**, in a strict sense of the word, or **GEOGOSY**, is the science which illustrates the structure, relative position, and mode of formation of the different mineral substances that compose the crust of the earth. This interesting part of mineralogy principally owes the distinguished rank it now holds among the sciences to the celebrated professor of Freyberg, who has however separated *geognosy*, or the science to which the above-given definition applies, from geology in the sense in which the word is taken by him; considering the latter as a merely speculative branch of knowledge, and as having nearly the same relation to the former which astrology has to astronomy. While *geognosy*, less intent upon enquiring into the primordial state of the globe, is contented with the merit of observing, of collecting and arranging simple facts in order to ascertain what *can* be known respecting the relative situation and ages of mineral substances.

*Geology* (in the sense in which the word is taken by Werner) aspires to the higher merit of recording the events of periods, when the planetary system of which the earth forms a part was yet uncreated, and of assigning causes to effects, and explaining phenomena, before it is ascertained whether they really have existence, or are merely the offspring of fancy and ignorance. The framers of most of the theories of extravagant notions, known by the appellation of *theories of the earth* (see EARTH and THEORIES of the Earth,) have been satisfied with a very moderate share of materials for their structures, not to mention that most of them were utterly unacquainted with the nature of the substances, the origin of which they undertook to elucidate. Nothing is better calculated to flatter self-love than to be mentioned as the creator of a theory of the earth; nothing easier, with a moderate share of imagination and less knowledge of facts, than to frame a new theory sufficiently distinct from all its precursors to be noticed; and nothing safer than to broach opinions which, though they cannot be proved true by their authors,

are certain to be left unrefuted by others. And who would be desirous to waste his time in refuting, or even remembering, all the theories of the earth now extant? Their number, amounting already to above half a hundred, appears to be daily increasing, and stands in need of classification to assist the memory; which, it must be allowed, might be more profitably employed in retaining those general observations which, unconnected with any theory of the earth, or with the Mosaic account, have in latter times been preferred to the world by a few unprejudiced geognostians. Instead of prematurely endeavouring to accommodate the little geognostic knowledge we possess to the events hinted at in the sacred hymn of creation, which was by no means intended for a system of geology; we should commence our researches in this field of knowledge with subjecting to a careful examination what nature produces as it were under our eyes, such as the manifold alterations that have taken place in the physiognomy of tracts of country almost within the memory of man. How little are we acquainted with the means which nature employs to form the very soil on which we tread, by converting into mould the various animal and vegetable exuvia! How scanty are the genuine observations we possess on the process of alluvial deposition! on the detritus accumulated at the foot of mountains by means of the decomposition of the various rocks! how little do we know of the processes employed to produce petrifications! and how little of the circumstances under which the latter occur! And yet many of these, and other phenomena within the sphere of human observation, will admit of considerable elucidation, and may lead to very interesting results, by applying to them sound principles of logic and induction. But researches of this nature require what few are inclined to bestow upon them, the patient observation of many years; and, what falls to the lot of few observers, a facility of combining and generalizing insulated facts. As an instance both of the difficulty and utility of such researches, if properly conducted, and of the little attention that has hitherto been paid to considerations that should precede any attempt at framing a system of geology, we advert only to the highly interesting discoveries made within the last twelve years, by Cuvier in the neighbourhood of Paris. It is in the confined space of the well known gyps-formation of that part of France that this incomparable naturalist has found the osseous remains of no less than fifteen quadrupeds, unlike any species now known to exist. Have these organized beings, it may be asked, lived in the places where their remains are found, or have they been carried thither? and are they still to be met with living, or to be considered totally or partly destroyed? It is obvious that the causes to be assigned for the occurrence of those petrifications must be diametrically opposite according as these two simple questions are answered in the affirmative or negative; and yet somebody has thought it worth while to satisfy himself respecting this circumstance; nor have any of the authors of the ten or twelve hypotheses that profess to explain the formation of the basin of Paris, been aware that in a solitary small corner of that basin, namely, at Grignon, there have been discovered by Lamarek, in the course of several years, about six hundred unknown species of shells, besides forty or fifty, of which the prototypes are supposed to be still existing.

We shall not attempt in this article to give a history of geology, which would be nothing more than a chronological exposition of the different theories of the earth (see EARTH, and THEORIES of the Earth): nor is it to naturalists of earlier periods than the latter end of the last century, that we are indebted for genuine observations in this department of science. But much as we owe to the exertions of

a Lehmann, Deluc, Dolomieu, and particularly Sauffure, who, in his celebrated *agenda*, has proved how well he knew the desiderata of geology, and what remained to be done to give this branch of knowledge all the perfection it is susceptible of; yet the merit of arranging, into a harmonious whole, a multiplicity of materials furnished by an intimate acquaintance with the internal structure of a considerable and highly interesting tract of country, is entirely due to Werner alone, being assisted by the most profound knowledge of the various mineral substances, and gifted with a happy faculty of generalizing facts, has produced a system of geology, at once simple and practical, and much more free from gratuitous assumption than all the rest. Professor James Hall is the first in this country who has given an exposition of the Wernerian geognosty, constituting the third volume of his "Mineralogy." The following is intended only as a brief sketch of that system, fuller details of which will be found under the various articles referred to.

The surface of the globe, considered relative to its inequalities, is divided into highland, lowland, and the bottom of the sea. The *highland* comprises, 1. Alpine land, composed of mountain groups or series of mountain chains; 2. Mountain chains, formed by a series of those still more simple inequalities, called 3. Mountains: in the former we consider their length, height, form, and connection; the parts of the latter are the foot, the acclivity, and the summit. See MOUNTAINS, and MOUNTAIN GROUPS.

*Lowland* we call those extensive flat tracts which are almost entirely destitute of small mountain groups, which latter, if they occur in them, generally occupy the middle part of the lowland. The principal lowland in Europe is the eastern part of Great Britain, the north of France, the adjacent Netherlands, the northern part of Germany and Silesia, the whole of Poland, the N. W. part of Russia, towards the Ural mountains, a very small part of Sweden, namely, Gothland. The second extensive lowland plain is in the centre of Asia; it is known by the name of the Steppes, and includes almost the whole N. E. part of Russia; some smaller ones are in Arabia. The extent of the lowland of Africa is not known. America has two considerable lowland plains: the one, in its northern half, is traversed by the Mississippi and Missouri, and borders towards the east by the Apalachian mountains, and the West India islands; the second, in South America, borders on the Andes. With these plains of the lowland are connected the *river-courses*, or river valleys, in which we have to consider the bed of the river and the holm or haugh land, the high and low bank of the river. (See RIVER-COURSE.) The considerably rising ground with which the lowland plains are frequently marked, is, by German geognostians, called *Land-höhen* when they are nearly of equal length and breadth, and *Land-rücken* when they have an elongated form.

The bottom of the sea, or that part of the globe which is still covered by water, may equally be considered with a view to its depressions and elevations; to the latter belong the flat, the rocky bottom, the shoals, reefs, and islands. See SEA and ISLAND.

It is only after a diligent study of the inequalities just pointed out, that we can with advantage undertake to explore the means employed by nature to produce them; and the first step is to proceed to the examination of the physical causes of the slow, but unceasing changes of the globe. Observation teaches us, that most of the elevations and hollows we meet with on the surface of the earth owe their origin to the action of the atmosphere, to that of the ocean, and to volcanic fire. These powerful agents may be considered



## GEOLOGY.

considered with regard to their *destroying*, and, in consequence of this destruction, with regard to their *forming* effects. The waters of the ocean possess the former of these powers in a superior degree; whole maritime districts are known to have been overwhelmed by their irregular action upon the land; but also the regular motion of the sea, ebb and flood tide, currents, &c. considerably contribute to gradually changing the face of the bottom of the sea, and of the shores on which they act. The destroying effects of the atmospheric waters are both mechanical and chemical; the former are produced by long continued rain, water-spouts, ice, snow, thaws, and consequent floods, by which considerable portions of rocks are detached and carried, together with other loose materials they meet, to more or less distant places, according as the bulk of these materials or the nature of the country, either favours or impedes their progress. The chemically destroying effects of water are less rapid, and depend on the solubility of the different rocks over which they flow. The forming effects of water, both mechanical and chemical, are the natural consequence of its destructive effects; examples of the former are sandbanks, changes of coasts, &c. Of the latter, beds of salt, calcareous, and other depositions, &c. See WATERS, *Atmospheric*, and OCEAN.

The effects of volcanic fire are destroying by means of the consumption of the inflammable materials, by desiccation and fusion; and forming by sublimation, and by the production of lavas and other volcanic ejections, by sublimation, &c. See VOLCANO.

From the description of the inequalities of the surface of the earth, and of the means employed in forming them, the Wernerian school proceeds to the consideration of the internal structure of the earth, the knowledge of which we derive from a careful examination of the order which nature has followed in the deposition of the mountain masses, and which is principally laid open to view in the chasms and sections produced by floods, &c. in natural caverns and in the interior of mines. By these means we may become acquainted with four different structures, besides that of the simple fossil, which is the object of Oryctognosy; 1. The structure of *rocks or mountain rocks*; these are either simple (such as limestone, clay-slate, serpentine), or aggregated, in which case the principal kinds of texture of the component parts are granular, stony, porphyritic, and amygdaloidal. (See ROCKS.) 2. A more general structure is that of *mountain masses*; these have either a simply stratified structure, *viz.* when a mountain, or mountain masses are composed of one species of rock divided into parallel tabular masses or strata; or they consist of alternating strata of different rocks, which in this case are called *beds*. Mountain masses also display what is termed *framed* structure, in which distinct concretions on a large scale are observable, such as the columnar, the large globular, and the club-shaped structure, several modifications of which are observed in basalt. Another variety of this structure is called *tabular framed* structure, which is not unlike stratification. (See MOUNTAIN MASSES, and STRATA.) A still more general structure is 3. The *structure of formations*, which term Werner applies to a determinate assemblage of several similar and dissimilar rock masses which constitute an independent whole. If the mass is uniform throughout; if, for instance, it consists entirely of sandstone, granite, &c. it is termed *simple*, whereas it is a *compound* formation, if it exhibits dissimilar masses, such as black coal with fletz-trap, &c. Some formations constitute the principal mass of a mountain in which they occur, (gneiss, clay-slate, porphyry, &c.) while others occur only imbedded (-1.07; byry, lime-stone, &c.); and these *beds*, if they occur

in different principal formations, and always under the same circumstances, notwithstanding the difference of the rocks in which they are found, and if, moreover, they form members of a series of formations, are considered as, and denominated *independent formations*. If the reverse of all this is observed in single beds, they are called *subordinate* to the formation in which they are imbedded, as is the case with the beds of roe-stone, in the second sand-stone, &c. For some further distinctions, see REPOSITORIES, *mineral*. The most general of the structures we know is, 4. That of the *crust of the earth*, composed of rock formations, which cover each other in certain directions, and in a regular manner. As to the original extent of formations in general, Werner terms *universal* formations those which, without great interruption, surround the whole globe, and thus constitute the greater part of its crust; to it belong almost the whole of the primitive, transition, and fletz-formation. *Partial* formations, on the other hand, are those that appear only in detached spots, and exhibit characters distinct from those of the universal formation: thus the deposition at Wehran in Lusatia (which Werner suspects to be the result of a small and partial flood) is composed of sand-stone, lime-stone, bituminous shale and iron-clay, which all rest on loose sand. The present extent and continuity of formations are so far different from the original, that those called *universal* often appear broken into small detached portions, frequently resembling partial formations, and they receive different names according to their different shapes, and the situations in which they are found. Other considerations relative to the structure of the crust of the globe are derived from the position and direction of the strata in regard to the fundamental or subjacent rock, from the direction of the strata without reference to the fundamental rock, and from the relation of the *outgoings* (*i. e.* the upper extremities of the different strata as they appear at the surface of the earth), to the exterior of the mountain; for which see STRATA.

A comparison of the different classes of rocks, and their succession and stratification, points out the following distinctions. The class of rocks on which all others rest, and which, on that account, is considered as the oldest, is the class of the *primitive rocks*, whose texture is often more or less crystalline, a quality denoting previous mechanical solution. They comprehend granite, gneiss, mica-slate, talc-slate, hornblende slate, sphenite, porphyry, serpentine, and lime-stone. These rocks are mostly disposed in conformable and unbroken stratification, each newer stratum with lower level, as is the case with gneiss, mica-slate, and clay-slate, while the granite beneath will sometimes appear to rise up through them, encompassed, in various manners, by the other rocks. (See ROCKS, *Primitive*.) The rocks next in succession are such as are likewise principally composed of chemical productions, but in which mechanical deposition is observed more abundantly the nearer they approach the following class; the rocks constituting this intermediate class are called *transition-rocks*. Lime-stone occurs more frequently in this than in the preceding class: the other rocks it contains are principally grey-wacke, grey-wacke slate, and clay-slate. (See TRANSITION-ROCKS.) To this succeeds, as of still later origin, the class of *fletz-rocks*, in which the mechanical deposits occur in greater abundance, at the same time that the chemical precipitation disappears. (See FLETZ-ROCKS.) The next class which bears the character of still more recent formation, is entirely composed of mechanical deposits, such as sand, clay, &c. See ROCKS, *Alluvial*.) But, besides these formations, the outgoings of which show gradually diminishing levels from the older to the newer, there are two others, the strata

of which, instead of having parallelism with, are superincumbent on, the outgoings of the other strata: they are called the *newest fletz-trap*, and the *newer porphyry formation*, and are seen to rest both on fletz-strata of very recent formation, and on elevated primitive mountains. The former of these formations is particularly interesting, as including rocks, whose origin has been, and continues to be, a subject of controversy between the Neptunists and Volcanists, such as basalt, wacke, &c. all of which, according to Werner, are the results of a deluge, or sudden rise of the water at a more recent period than that in which the fletz-mountains were formed. (See *FLETZ-Rocks* and *TRAP-Formation*.) The second of these great formations, occurring in the same unconformable stratification, consists of porphyry, syenite, and pitch-stone, and is supposed of much older origin than the newest fletz-trap-formation, with which, however, it agrees in many respects. See *PORPHYRY*.

No geologist before Werner has pointed out the succession in which the different suites of formations have been deposited from the water at different periods; a succession which shows the alterations that fluid has undergone with regard to the substances it held, at different times, either chemically dissolved, or mechanically floating. Thus the oldest of the primitive rocks contain metals almost peculiar to them, and which, therefore, were not again deposited in succeeding periods, such as tin, molybden, and tungsten; and in several cases, one and the same substance, (such as lime-stone,) though it be repeated at considerable intervals, still adopts in each of them a peculiar character. These suites are, 1. That of the *lime-stone formation*, beginning with the primitive crystalline granular lime-stone, and passing, by insensible gradations, through the transition, and fletz-lime stones, into the lowermost links of the series, *viz.* chalk and calcareous tuf. 2. That of the *slate formation*: its central point is clay-slate (from which this formation derives its name), passing, on one hand, through mica-slate into gneiss, when the slaty structure gradually disappears, and a passage is formed into the oldest member, namely granite; and, on the other hand, through transition-slate, grey-wacke slate, and grey-wacke, into the series of fletz sand-stones, and from thence into the alluvial series, consisting of slate clay, loam, sand, and gravel. 3. The *trap-formation suite* passes from the primitive hornblende-slate, characterized by its crystalline nature, and from the primitive green-stone, and green-stone slate, through the transition green-stone, into the fletz-trap, formed chiefly of amygdaloid, and from thence into the newest fletz-trap formation, consisting principally of basalt and wacke, unconformably superincumbent on rocks of various antiquity. 4. The *porphyry formation suite* is equally characteristic in its different members, from old primitive porphyry down to that mentioned above, as of similar origin with the newest fletz-trap formation: the nature of the different members of this formation stand, however, in need of further examination. (See *PORPHYRY*.) 5. The *gypsr-formation* comprises three principal members, the oldest of which, or the primitive gypsum, occurs in mica-slate and clay-slate; the second and third are fletz-gypsum, the former of them accompanying the following, or 6. *Salt-formation*, which constitutes two series, one of which occurs only with fletz-gypsum, (see *FLETZ-Rocks*), while the other is still forming on the bottom of lakes, &c. (See *Rock-Salt*.) 7. The *coal-formation-suite*, comprising, besides the independent coal formation, various varieties of coal belonging to the fletz-trap formation, and to alluvial depositions; the members of this suite require farther investigation. (See *FLETZ-Rocks*, and *COAL*.) 8. The *Serpentin-formation suite* is composed, as far as we know, of two

members, the first or elder occurring with primitive rocks, especially primitive lime-stone, in conformable stratification; and the second or newer, found in an unconformable and overlying position on the older rocks. See *SERPENTINE*.

For further particulars relating to the Wernerian system of geognosy, we refer to the articles *STRATA*, *VEIN*, and *WATERS*, *Diminution of*.

**GEOMANCY**, *GEOMANTIA*, a kind of divination, performed by means of a number of little points, or dots, made on paper at random: and considering the various lines and figures which those points present: and thence forming a pretended judgment of futurity, and deciding any question proposed.

The word is formed of the Greek  $\gamma\eta$ , *terra, earth*; and  $\mu\alpha\gamma\alpha$ , *divination*: it being the ancient custom to cast little pebbles on the ground, and thence to form their conjectures; instead of the points afterwards made use of.

Polydore Virgil defines geomancy a kind of divination performed by means of clefts, or chinks made in the ground; and takes the Persian Magi to have been the inventors thereof.

**GEOMETRICAL**, something that has a relation to *geometry*.

Thus we say, a geometrical method, a geometrical genius, geometrical strictness, geometrical construction, geometrical demonstration.

Geometry itself seems to lead us into errors; after once reducing a thing to geometrical consideration, and finding that it answers pretty exactly, we pursue the view, are pleased with the certainty and agreeableness of the demonstrations, and apply the geometry farther and farther, till we often outrun nature.

Hence it is, that all machines do not succeed: that all compositions of music, wherein the concords are the most rigidly observed, are not agreeable: that the most exact astronomical computations do not always foretell the precise time and quality of an eclipse, &c.

The reason is, that nature is not a mere abstract; mechanical levers and wheels are not geometrical lines and circles; as they are often supposed to be: the taste for tunes is not the same in all men; nor at all times in the same man: and as to astronomy, as there is no perfect regularity in the motions of the planets, their orbits hardly seem reducible to any fixed, known figure.

The errors, therefore, we fall into in astronomy, music, mechanics, and the other sciences to which geometry is applied, do not properly arise from geometry, which is an infallible science, but from the false use, or the misapplication of it.

**GEOMETRICAL Construction** of an equation, is the contriving and drawing of lines and figures, whereby to demonstrate the equation, theorem, or canon, to be geometrically true. See *CONSTRUCTION of Equations*.

**GEOMETRICAL Line or Curve**, called also *algebraic line or curve*, is that wherein the relations of the abscissas to the semi-ordinates may be expressed by an algebraic equation. See *CURVE*.

Geometrical lines are distinguished into classes, orders, or genera, according to the number of the dimensions of the equation that expresses the relation between the ordinates and the abscissas: or, which amounts to the same, according to the number of points in which they may be cut by a right line.

Thus a line of the first order will be only a right line: that of the second, or quadratic order, will be the circle, and

and the conic sections; and those of the third, or cubic order, will be the cubical and Nelian parabolas, the cissoïd of the ancients, &c.

But the curve of the first gender (because a right line cannot be reckoned among the curves) is the same with a line of the second order; and a curve of the second gender, the same with a line of the third order; and a line of an infinitesimal order is that which a right line may cut in infinite points; as the spiral, cycloid, the quadratrix, and every line generated by the infinite revolutions of a radius.

However, it is not the equation, but the description, that makes the curve a geometrical one; the circle is a geometrical line, not because it may be expressed by an equation, but because its description is a postulate: and it is not the simplicity of the equation, but the easiness of the description, which is to determine the choice of the lines for the construction of a problem. The equation that expresses a parabola is more simple than that which expresses a circle; and yet the circle, by reason of its more simple construction, is admitted before it.

The circle and the conic sections, if you regard the dimensions of the equations, are of the same order; and yet the circle is not numbered with them in the construction of problems; but by reason of its simple description is depressed to a lower order; viz. that of a right line; so that it is not improper to express that by a circle, which may be expressed by a right line, but it is a fault to construct that by the conic sections, which may be constructed by a circle.

Either, therefore, the law must be taken from the dimensions of equations, as observed in a circle, and so the distinction be taken away between plane and solid problems: or the law must be allowed not to be strictly observed in lines of superior kinds; but that some, by reason of their more simple description may be preferred to others of the same order, and be numbered with lines of inferior orders.

In constructions that are equally geometrical, the most simple are always to be preferred: this law is so universal as to be without exception. But algebraic expressions add nothing to the simplicity of the construction; the bare descriptions of the lines here are only to be considered; and these alone were considered by those geometers, who joined a circle with a right line. And as these are easy or hard, the construction becomes easy or hard: and therefore it is foreign to the nature of the thing, from any thing else to establish laws about constructions.

Either, therefore, with the ancients, we must exclude all lines beside the circle, and perhaps the conic sections, out of geometry; or admit all according to the simplicity of the description: if the trochoid were admitted into geometry, we might, by its means, divide an angle in any given ratio: would you therefore blame those who would make use of this line to divide an angle in the ratio of one number to another; and contend, that this line was not defined by an equation, but that you must make use of such lines as are defined by equations?

If, when an angle were to be divided, for instance, into 1001 parts, we should be obliged to bring a curve defined by an equation of above a hundred dimensions to do the business; which nobody could describe, much less understand; and should prefer this to the trochoid, which is a line well known, and described easily by the motion of a wheel, or circle: who would not see the absurdity?

Either, therefore, the trochoid is not to be admitted at all in geometry; or else, in the construction of problems, it

is to be preferred to all lines of a more difficult description, and the reason is the same for other curves. Hence, the trisections of an angle by a conchoid, which Archimedes, in his Lemmas, and Pappus, in his Collections, have preferred to the invention of all others in this case, must be allowed to be good; since we must either exclude all lines, beside the circle and right line, out of geometry, or admit them according to the simplicity of their descriptions; in which case the conchoid yields to none except the circle. Equations are expressions of arithmetical computation, and properly have no place in geometry, except so far as quantities truly geometrical (that is, lines, surfaces, solids, and proportions) may be said to be some equal to others: multiplications, divisions, and such sort of computations, are newly received into geometry, and that apparently contrary to the first design of this science: for whoever considers the construction of problems by a right line and a circle, found by the first geometers, will easily perceive that geometry was introduced that we might expeditiously avoid, by drawing lines, the tediousness of computation.

It should seem, therefore, that the two sciences ought not to be confounded together: the ancients so industriously distinguished them, that they never introduced arithmetical terms into geometry; and the moderns, by confounding both, have lost a great deal of that simplicity, in which the elegance of geometry principally consists. Upon the whole, that is arithmetically more simple, which is determined by more simple equations; but that is geometrically more simple which is determined by the more simple drawing of lines; and in geometry, that ought to be reckoned best which is geometrically most simple.

GEOMETRICAL *Locus*, or *Place*, called also simply *locus*. See *LOCUS*.

GEOMETRICAL *Medium*. See *MEDIUM*.

GEOMETRICAL *Method of the Ancients*. It is to be observed that the ancients established the higher parts of their geometry on the same principles as the elements of that science, by demonstrations of the same kind; and that they seem to have been careful not to suppose any thing done, till by a previous problem they had shown how it was to be performed. Far less did they suppose any thing to be done that cannot be conceived, as a line or series to be actually continued to infinity, or a magnitude to be diminished till it becomes infinitely less than what it was. The elements into which they resolved magnitudes were finite, and such as might be conceived to be real. Unbounded liberties have been introduced of late, by which geometry, which ought to be perfectly clear, is filled with mysteries. See *Maclaurin's Fluxions*, Intr. p. 39. seq.

GEOMETRICAL *Osculum*. See *CURVE*, *EVOLUTE*, and *OSCULUM*.

GEOMETRICAL *Pace*, is a measure consisting of five feet. See *PACE*, and *FOOT*.

GEOMETRICAL *Plan*, in *Architecture*. See *PLAN*.

GEOMETRICAL *Plane*. See *PLANE*.

GEOMETRICAL *Progression*. See *Geometrical PROGRESSION*.

GEOMETRICAL *Proportion*, called also absolutely, and simply, *proportion*, is a similitude or identity of ratios. See *RATIO*.

Thus, if A be to B, as C to D, they are in geometrical proportion: so 8, 4, 32, and 15, are geometrical proportions. See *PROPORTION*.

GEOMETRICAL *Solution* of a problem, is when the problem is directly solved according to the strict principles and rules of geometry, and by lines that are truly geometrical.

In this sense we say, geometrical solution in contradistinction to a mechanical, or instrumental solution, where the problem is only solved by ruler and compasses.

The same term is likewise used in opposition to all indirect and inadequate kinds of solutions, as by infinite serieses, &c.

We have no geometrical way of finding the quadrature of the circle, the duplication of the cube, or two mean proportionals; but mechanical ways, and others, by infinite serieses, we have.

The ancients, Pappus informs us, in vain endeavoured at the trisection of an angle, and the finding out of two mean proportionals by a right line, and a circle. Afterwards they began to consider the properties of several other lines; as the conchoid, the cissoid, and the conic sections; and by some of these endeavoured to solve those problems. At length, having more thoroughly examined the matter, and the conic sections being received into geometry, they distinguished geometrical problems into three kinds; *viz.*

1. *Plane* ones, which, deriving their original from lines on a plane, may be regularly solved by a right line, and a circle.

2. *Solid* ones, which are solved by lines deriving their original from the consideration of a solid; that is, of a cone.

3. *Linear* ones, to the solution of which are required lines more compounded.

According to this distinction we are not to solve solid problems by other lines than the conic sections; especially if no other lines but right ones, a circle, and the conic sections, must be received into geometry.

But the moderns, advancing much farther, have received into geometry all lines that can be expressed by equations; and have distinguished, according to the dimensions of the equations, those lines into kinds; and have made it a law, not to construct a problem by a line of superior kind, that may be constructed by one of an inferior kind.

GEOMETRICAL Square. See SQUARE.

GEOMETRICAL Table. See PLAIN Table.

GEOMETRICALLY PROPORTIONALS, are quantities in continual proportion; or which proceed in the same constant ratio: as 6, 12, 24, 48, 96, 192, &c.

They are thus called, in contradistinction to equi-different quantities; which are called, though somewhat improperly, *arithmetically proportionals*.

GEOMETRY, the science, or doctrine of extension, or extended things; that is, of lines, surfaces, or solids.

The word is Greek *γεωμετρικη*, formed of *γη* or *γη*, earth, and *μετρον*, measure: it being the necessity of measuring the earth, and the parts and places thereof, that gave the first occasion to the invention of the principles and rules of this art; which has since been extended and applied to numerous other things; inasmuch that geometry, with arithmetic, is now the general foundation of all mathematics.

Herodotus, lib. ii. p. 102. edit. Wesselingii, Diodorus, lib. i. § 81, or vol. i. p. 91. edit. Amst. 1746. and Strabo, lib. xvii. vol. ii. p. 1139. edit. Amst. 1707. assert, that the Egyptians were the first inventors of geometry: and that the annual inundations of the Nile were the occasion of it: for that river bearing away all the bounds and landmarks of men's estates, and covering the whole face of the country, the people, say they, were obliged to distinguish their lands by the consideration of their figure and quantity; and thus,

by experience and habit, formed themselves a method, or art, which was the origin of geometry. A farther contemplation of the draughts of figures, of fields thus laid down, and plotted in proportion, might naturally enough lead them to the discovery of some of their excellent and wonderful properties; which speculation continually improving, the art became gradually improved, as it continues to do to this day. Josephus, however, seems to attribute the invention to the Hebrews: and others, among the ancients, make Mercury the inventor. Polyd. Virgil, De Invent. Rer. lib. i. cap. 18.

From Egypt geometry passed into Greece, being carried thither, as some say, by Thales; where it was much cultivated and improved by himself, Pythagoras, Anaxagoras of Clazomene, Hippocrates of Chios, and Plato, who testified his conviction of the necessity and importance of geometry in order to the successful study of philosophy by the following inscription on the door of his academy, *εἰς αὐτὴν οὐκ ἔστιν εἰσθῆναι τὸν ἀγεωμέτρητον*, let no one ignorant of geometry enter here. Plato, conceiving that geometry was too mean and restricted an appellation for this science, substituted for it the more extensive name of "Mensuration;" and others have denominated it "Pantometry." Other more general and comprehensive appellations are more suitable to its extent, more especially in the present advanced state of the science; and accordingly some have defined it as the science of inquiring, inventing, and demonstrating all the affections of magnitude. Proclus calls it the knowledge of magnitudes and figures, with their limitations; as also of their ratios, affections, positions, and motions of every kind. About fifty years after Plato, lived Euclid, who collected together all those theorems which had been invented by his predecessors in Egypt and Greece, and digested them into fifteen books, entitled the Elements of Geometry; and those propositions which were not satisfactorily proved, he more accurately demonstrated. (See EUCLID.) The next to Euclid of those ancient writers, whose works are extant, is Apollonius Pergæus, who flourished in the time of Ptolemy Euergetes, about two hundred and thirty years before Christ, and about a hundred years after Euclid. (See his biographical article.) The third ancient geometer, whose writings remain, is Archimedes of Syracuse, who was famous about the same time with Apollonius. (See ARCHIMEDES.) We can only mention Eudoxus of Cnidus, Archytas of Tarentum, Philolaus, Eratosthenes, Aristarchus of Samos, Dinostratus, the inventor of the quadratrix, Menechmus, his brother and the disciple of Plato, the two Arilleufes, Conon, Thrastides, Nicoteles, Leon, Theudius, Hermodimus, and Nicomedes, the inventor of the conchoid; besides whom, there are many other ancient geometers, to whom this science is indebted.

The Greeks continued their attention to geometry even after they were subdued by the Romans. Whereas the Romans themselves were so little acquainted with this science, even in the most flourishing time of their republic, that they gave the name of mathematicians, as Tacitus informs us, to those who pursued the chimeras of divination and judiciary astrology. Nor were they more disposed to cultivate geometry, as we may reasonably imagine, during the decline, and after the fall of the Roman empire. The case was different with the Greeks; among whom we find many excellent geometers since the commencement of the Christian era, and after the translation of the Roman empire. Ptolemy lived under Marcus Aurelius; and we have extant the works of Pappus of Alexandria, who lived in the time of Theodosius; the commentary of Eutocius, the Ascalonite, who lived about the year of Christ 540, on

Archimedes's mensuration of a circle; and the commentary on Euclid, by Proclus, who lived under the empire of Anastasius.

The consequent inundation of ignorance and barbarism was unfavourable to geometry as well as to the other sciences; and those few who applied themselves to this science, &c. were calumniated as magicians. However, in those times of European darkness, the Arabians were distinguished as the guardians and promoters of science; and from the ninth to the fourteenth century they produced many astronomers, geometers, geographers, &c. from whom the mathematical sciences were again received into Spain, Italy, and other parts of Europe, somewhat before the beginning of the 15th century. Some of the earliest writers after this period are Leonardus Pifenus, Lucas Pacioli or de Burgo, and others between 1400 and 1500. After this period appeared many editions of Euclid, or commentaries upon his Elements; e. g. Orontius Fineus, in 1530, published a commentary on the six first books; as did James Peletarius in 1557; and about the same time Nicholas Tartaglia published a commentary on the whole 15 books. We might here mention other editions or commentaries; such are those of Commandine, Clavius, Billingsly, Schéubelius, Harlinus, Dafypodius, Rannus, Herigon, Stevinus, Saville, Barrow, Tuccet, Dechales, Furnier, Scarborough, Keill, Cunn, Stone, and many others. (See ELEMENTS.)

At the revival of letters, there were few Europeans capable of translating and commenting on the works of the ancient geometers; and geometry made little progress till the time of Des Cartes, who published his Geometry in 1637. However, not to mention all those who extended geometry beyond its elementary parts, such as Theodosius in his Spherics, Serenus in his sections of the cone and cylinder, Kepler in his Nova Stereometria, &c. in 1635, Bonaventure Cavalieri, an Italian of the order of Jesuits, published his "Geometry of Indivisibles;" Torricelli his "Opera Geometrica;" Viviani, his "Divinationes Geometricæ," "Exercitatio Mathematica," "De Locis Solidis," "De Maximi et Minimis," &c.; Vieta, his "Effectio Geometrica," &c.; Gregory St. Vincent, in 1647, published his treatise, entitled "Quadratura Circuli & Hyperbolæ," a work abounding with excellent theorems and paralogisms; and Pascal, about the same time, published his treatise of the cycloid. Geometry, as far as it was capable of deriving aid and improvement from the arithmetic of infinites, was indebted to the labours of Fermat, Barrow, Wallis, Mercator, Brounker, J. Gregory, Huygens, and others, to whom we may add Newton and Leibnitz. (See FLUXIONS.) But Sir Isaac Newton contributed to the progress of pure geometry by his two treatises, "De Quadratura Curvarum," and "Enumeratio Linearum Tertii Ordinis" (see CURVE); and still farther by his incomparable and immortal work, entitled "Philosophiæ Naturalis Principia Mathematica," which will always be considered as the most extensive and successful application of geometry to physics. We cannot forbear transferring in this place the compliment paid to this author by the editors of the Encyclopædic, who, considering the various monuments of the author's genius, and that he had made his principal discovery before the age of twenty-four, are tempted, they say, to subscribe to the words of Pope, that the sagacity of Newton assumes even celestial intelligences, and that they contemplate him as a being occupying a kind of middle station between man and himself; or at least they cannot forbear exclaiming, *homo homini quid præstat!* what a distance does there subsist between one man and another!

The modern geometers are innumerable; and the names of Cote, Maclaurin, R. Simson, T. Stewart, T. Simpson, &c.

not to mention living writers, will always be held in esteem and veneration by those that are devoted to the study of geometry and mathematics. See ELEMENTS.

The province of geometry is almost infinite: few of our ideas but may be represented to the imagination by lines, upon which they become of geometrical consideration: it being geometry alone that makes comparisons, and finds the relations of lines.

Astronomy, music, mechanics, and, in a word, all the sciences which consider things susceptible of more and less, *i. e.* all the precise and accurate sciences, may be referred to geometry; for all speculative truths consisting only in the relations of things, and in the relations between those relations, they may be all referred to lines. Consequences may be drawn from them; and these consequences, again, being rendered sensible by lines, they become permanent objects, which may be constantly exposed to a rigorous attention and examination; and thus we have infinite opportunities both of enquiring into their certainty, and pursuing them farther.

The reason, for instance, why we know so distinctly, and mark so precisely, the concords called *octave, fifth, fourth,* &c. is that we have learnt to express sounds by lines, *i. e.* by chords accurately divided; and that we know, that the chord, which sounds octave, is double of that with which it makes octave; that the fifth is the sesquialterate ratio, or as three to two; and so of the rest. The ear itself cannot judge of sounds with such a nice precision; its judgments are too faint, vague, and variable, to form a science. The finest best-tuned ear cannot distinguish many of the differences of sounds; whence many musicians deny any such differences; as making this sense their judge. Some, for instance, admit no difference between an octave and three ditones; and others, none between the greater and lesser tone; the comma, which is the real difference, is insensible to them; and much more the schisma, which is only half the comma.

It is only by reason, then, that we learn, that the length of the chord which makes the difference between certain sounds being divisible into several parts, there may be a great number of different sounds contained therein, useful in music, which yet the ear cannot distinguish. Whence it follows, that had it not been for arithmetic and geometry, we should have had no such thing as regular fixed music; and that we could only have succeeded in that art by good luck, or force of imagination; *i. e.* music would not have been any science founded on incontestible demonstrations; though we allow, that the tunes composed by force of genius and imagination, are usually more agreeable to the ear than those composed by rule. So, in mechanics, the heaviness of a weight, and the distance of the centre of that weight from the fulcrum, or point by which it is sustained, being susceptible of plus and minus, they may both be expressed by lines: whence geometry becomes applicable to this science; in virtue of which, infinite discoveries have been made, of the utmost use in life.

Geometrical lines and figures are not only proper to represent to the imagination the relations between magnitudes, or between things susceptible of more and less; as spaces, times, weights, motions, &c. but they may even represent things which the mind can no otherwise conceive, *e. gr.* the relations of incommensurable magnitudes.

It must be observed, that this use of geometry among the ancients was not strictly scientific, as among us; but rather symbolical: they did not argue, or deduce things and properties unknown, from lines; but represented or delineated by them things that were known. In effect, they were not used as means or instruments of discovering, but as images or characters, to preserve, or communicate, the discoveries that were already made.

“The Egyptians,” Gale observes, “used geometrical figures, not only to express the generations, mutations, and destructions of bodies; but the manner, attributes, &c. of the spirit of the universe, who, diffusing himself from the centre of his unity, through infinite concentric circles, pervades all bodies, and fills all space. But of all other figures they most affected the circle and triangle; the first, as being the most perfect, simple, capacious, &c. of all figures: whence Hermes borrowed it to represent the divine nature; defining God to be an intellectual circle or sphere, whose centre is everywhere, and circumference nowhere.” See Kirch. *Œdip. Ægyptiac.* and Gale *Phil. General.* lib. ii. cap. 2.

The ancient geometry was confined to very narrow bounds, in comparison of the modern. It only extended to right lines and curves of the first order, or conic sections; whereas into the modern geometry new lines of infinitely more and higher orders are introduced.

Geometry is commonly divided into four parts, or branches; planimetry, altimetry, longimetry, and stereometry; which see respectively.

Geometry, again, is distinguished into *theoretical* or *speculative*, and *practical*.

The first contemplates the properties of continuity; and demonstrates the truth of general propositions, called *theorems*.

The second applies those speculations and theorems to particular uses in the solution of *problems*.

GEOMETRY, *speculative*, again may be distinguished into *elementary* and *sublime*.

GEOMETRY, *elementary* or *common*, is that employed in the consideration of right lines, and plane surfaces, and solids generated from them.

GEOMETRY, *higher*, or *sublime*, is that employed in the consideration of curve lines, conic sections, and bodies formed of them.

The writers who have cultivated and improved geometry may be distinguished into elementary, practical, and those of the sublimer geometry.

The principal writers of elements, see enumerated under ELEMENTS.

Those of the higher geometry are Archimedes, in his books *De Sphæra*, *Cylindro*, and *Circuli Dimensione*; as also *De Spiralibus*, *Conoidibus*, *Sphaeroidibus*, *De Quadratura Parabolæ*, and *Arenarius*: Kepler, in his *Stereometria Nova*; Cavalieri, in his *Geometria Indivisibilium*; and Torricellius, *De Solidis Sphaerulibus*; Pappus Alexandrinus, in *Collectionibus Mathematicis*; Paulus Guldinus, in his *Mechanics* and *Statics*; Barrow, in his *Lectiones Geometricæ*; Huygens, *De Circuli Magnitudine*; Bullialdus, *De Lineis Spiralibus*; Schooten, in his *Exercitationes Mathematicæ*; De Billy, *De Proportionibus Harmonicis*; Lavoiera, *De Cycloide*, For. Ernest. Com. ab Harbenstein, in *Diatome Circulorum*; Viviani, in *Exercit. Mathematic. de Formatione & Mensura Formicium*; Bap. Palma, in *Geomet. Exercitation.* and Apoll. Pergæus, *De Sectionibus Rationis*.

For practical geometry, the fullest and completest treatises are those of Mallet, written in French, but without the demonstrations; and those of Schwenter and Cantzlerus, both in High Dutch. In this class are likewise to be ranked Clavius's, Tacquet's, and Ozanam's *Practical Geometries*; De la Hire's *Ecole des Arpenteurs*; Reinholdus's *Geodesia*; Hartman Beyers's *Stereometria*; Voigtel's *Geometria Subterranea*; all in High Dutch: Hülcius, Galileus, Goldmannus, Scheffelt, and Ozanam, on the *Sector*. &c. &c.

The science of geometry is founded on certain axioms, or

self-evident truths (see *AXIOM*); it is introduced by definitions of the various objects which it contemplates, and the properties of which it investigates and demonstrates, such as points, lines, angles, figures, surfaces, and solids:—lines again are considered as straight or curved; and in their relation to one another, either as inclined or parallel, or as perpendicular:—angles as right, oblique, acute, obtuse, external, vertical, &c.:—figures, with regard to their various boundaries, as triangles, which are, in respect of their sides, equilateral, isosceles, and scalene, and in reference to their angles, right-angled, obtuse-angled, and acute-angled; as quadrilaterals, which comprehend the parallelogram, including the rectangle and square, the rhombus and rhomboid, and the trapezium and trapezoid; as multilaterals or polygons, comprehending the pentagon, hexagon, heptagon, &c.; and as circles:—and as solids, including a prism, parallelepipedon, cube, pyramid, cylinder, cone, sphere, and the frustum of either of the latter. We shall not here attempt to compile a complete system of geometry, as it would occupy too many of our pages, in a work from its nature protracted and enlarged to a very great extent; and this is the less necessary, because the reader will find under the titles above enumerated, and others naturally connected with and derived from them, the most essential and important principles of geometry, together with the operations that are founded upon them; and because any person who is desirous of acquainting himself with the science of geometry, in its whole extent and application, will have recourse to one or other of those numerous treatises, in a more enlarged or more compendious form, which may be easily procured.

The Elements of Euclid by Dr. R. Simpfon occur first to our recollection, and deserve particular recommendation; but the object of the geometrical student may be satisfactorily attained by T. Simpfon's *Geometry*, or by the treatises of Emerson, Hutton, Bonnycastle, Leslie, &c. &c.

But as the analytic method of treating geometrical questions is less generally known, and as complete treatises on this subject are only to be found in foreign works, we have been induced to devote a considerable space to this part of the science; the following treatise is chiefly compiled from the “*Feuilles d'Analyse*” by Monge, which were published in separate portions for the use of the polytechnic school, and afterwards collected in a quarto volume. A more elementary work has lately been published by Garnier in octavo, to which the reader is referred.

GEOMETRY, *Analytic*.—Method of defining the position of a point in a plane.

A point M (*Analyfis*, Plate VIII. fig. 1.) is defined by referring its position to two lines, as A Y, A X, generally at right angles to each other, but they may be inclined at any given angle.

If M Q be drawn perpendicular to A Y, and M P perpendicular to A X, then Q M, M P, are called the co-ordinates of the point M; the distance of the point from A Y is usually denoted by  $x$ , and its distance from A X by  $y$ .

The point of intersection of the two lines A Y, A X is called the origin of the co-ordinates, and the lines A Y, A X, produced each way to Y' and X', are called axes.

If the distance of the point M from these axes is given, viz.  $M Q = a$ ,  $M P = b$ , then  $x = a$ ,  $y = b$  is the equation to the point M.

But if the point M be situated in any other of the angles, the sign of  $a$  and  $b$  will vary, and these variations are governed by the same rules, as the sines and cosines in trigonometry.

For instance, if the point M is situated in the angle  
Y A X,



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Y A X, then  $x = + a, y = + b$   
 The equation of M' is  $x = - a, y = + b$   
 M'' is  $x = - a, y = - b$   
 M''' is  $x = + a, y = - b$

If the point M is situated on the line A X, then  $y = 0, x = a$ .

If it is situated on A Y, then  $x = 0; y = b$ , and at the point A,  $x = 0; y = 0$ .

The point M may likewise be defined by the length of the line A M, and by the angle  $\phi$ , which it makes with the axis A X. If this length be expressed by  $z$ , and the angle by  $\phi$ ,  
 $z = c; \phi = A$

$A^\circ$  being the number of degrees contained in the angle  $\phi$ , and  $c$  the value of  $z$ .

The position of a straight line is determined in a plane by the co-ordinates of two of its points, or by the co-ordinates of a single point, and the angle which it makes with one of its axes: the latter is the method most usually employed.

If the line passes through the origin of the axes, its position is determined by the angle which it makes with the axis.

We shall first consider this case as being the most simple. Let it be proposed to determine the relation between the co-ordinates of any point in such a straight line.

Let us take, for example, a point M (*fig. 2.*) whose abscissa is A P' =  $x'$ , P' M' =  $y'$ : these co-ordinates, like those of the other points, making an angle  $\alpha$  with each other, which is that of the axes, we shall have this equation;

$$\frac{y'}{x'} = \frac{\sin. \alpha}{\sin. (\phi - \alpha)}$$

and for the points M', M'', &c. whose co-ordinates would be  $x'', y''; x''', y'''$ , &c. we have

$$\frac{y''}{x''} = \frac{\sin. \alpha}{\sin. (\phi - \alpha)}, \frac{y'''}{x'''} = \frac{\sin. \alpha}{\sin. (\phi - \alpha)}, \&c.$$

If  $x, y$  represent the co-ordinates of any point in A L, the general equation will be

$$\frac{y}{x} = \frac{\sin. \alpha}{\sin. (\phi - \alpha)} \dots \dots \dots (1)$$

thus  $x$  becoming successively  $x', x'', \&c.$   $y$  changes to the corresponding ordinates  $y', y'', \&c.$  The formula (1) is called the equation of a straight line; it is the algebraic enunciation of a property common to all its points, and is thus written;

$$y = \frac{\sin. \alpha}{\sin. (\phi - \alpha)} x \dots \dots \dots (2)$$

The abscissa  $x$  being given, the ordinate  $y$  may be deduced.

When the angle  $\alpha$  varies, the line changes its position, turning round the point A; thus another ordinate  $y$  corresponds to the same abscissa  $x$ , which also happens if  $\phi$  varies, but it is essential to observe that for all the values both of  $\alpha$  and  $\phi$ , the equation (2) retains the same form.

If it should be required to find the relation between the co-ordinates of the point of a straight line R' L', situated in any manner whatever, then if A L be drawn parallel to R' L', passing through the point A, we shall observe that for the same abscissa  $x$  every ordinate of A L, for example; P' M' will be augmented by the same quantity A R =  $b$ ; let  $y + b$  be represented by  $y$ , equation of R' L' will be according to (2);

$$y = \frac{\sin. \alpha}{\sin. (\phi - \alpha)} x + b \dots \dots \dots (3)$$

Here  $a$  and  $b$  give the position of the straight line R' L';

when these quantities are known it may be constructed, but if the line is subject to any particular conditions, as, to pass through a given point; to be either parallel or perpendicular to a given line; to pass through two points, &c.  $a$  and  $b$  become unknown quantities, as we shall see immediately.

Let us suppose the quantities  $a, \phi$ , and  $b$  given, and that it is required to construct the straight line  $y = \frac{\sin. \alpha}{\sin. (\phi - \alpha)}$

$x + b$ ; the problem is reduced to finding two of these points; we endeavour to find the points in which the line cuts the two axes A X, A Y, (*fig. 3.*) the intersection R being the only point of the line in which  $x = 0$ , and R' the only point of the same line in which  $y = 0$ ; we suppose, successively,  $x = 0, y = 0$ , and we shall find  $y = b =$

$$A R, x = - \frac{\sin. (\phi - \alpha)}{\sin. \alpha} b = A R';$$

taking, then, A R' on the other side of the point A, if it is negative, and A R on A Y if it is positive, the line drawn through these two points will be that belonging to the equation.

If the equation to a straight line  $y = x + 1$  be supposed to refer to two axes, making an angle of  $45^\circ$  with each other, and the inclination,  $\alpha$ , which the line makes with the axis X

be required; since  $\frac{\sin. \alpha}{\sin. 45^\circ - \alpha} = 1, \sin. \alpha = \frac{1}{\sqrt{2}} \cos. \alpha$

$$- \frac{1}{\sqrt{2}} \sin. \alpha; \text{ consequently, } \tan. \alpha = \frac{1}{1 + \sqrt{2}}.$$

The value of  $b$  remaining constant, the line takes every possible position round the point R (*fig. 2.*) for every possible angle from  $0$  to  $360^\circ$ ; for every angular value of  $\alpha$ , taken with every ordinate  $b$ , positive and negative, the line will pass through every point of the axis Y Y'. There exists, therefore, no line in the same plane that cannot be defined by equation (3), provided  $b$  and  $\alpha$  are taken of a proper value.

The angle  $\beta$  has no influence on the position of the line; the variations of this angle only affect the inclination of the ordinate upon the axis of the abscissa; so that for the same abscissa, the ordinate corresponds with another point in the line.

But, in general, the co-ordinates are supposed rectangular; in which case,  $\sin. \beta = \sin. 90^\circ = 1$ , and  $\sin. (\beta - \alpha) = \cos. \alpha$ ; and equation (3) becomes  $y = x \tan. \alpha + b = a x + b$ ,  $a$  being supposed the  $\tan.$

When the straight line passes through the origin of the co-ordinates, its equation becomes  $y = a x$ .

This equation is constructed by taking A P =  $r =$  radius, and then setting off from a scale of equal parts the value of  $a$  on the perpendicular P M (*fig. 4.*); P M being equal to  $a$ , M will be a point in the required line.

We may now construct the equation  $y = x + 1, y = -x - 1$ .

These two lines cut the axis A X in the same point, and are situated similarly to it, one above, the other below; they are moreover perpendicular to each other.

The straight lines  $y = -x - 1, y = -x + 1$ , are parallel, because they make the same angle with the axis, having the same tangent,  $-1$ .

The straight line expressed by the equation  $y = x \sqrt{-1} - 1$  is reduced to a point on the axis Y below the origin, and distant from it by a quantity equal to unity, since, for every other value than zero, the ordinate is imaginary.

The

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The problems relating to a straight line, in general, require the unknown quantities  $a$  and  $b$  to be determined, so that the required line  $y = ax + b$  (1) may have the required position.

### PROBLEM I.

To make a straight line pass through two given points. Let the co-ordinates of one point be  $x', y'$ , and of the other  $x'', y''$ ; which signifies that when the ordinate generally expressed by  $y$  becomes  $y'$ , the ordinate  $x$  becomes  $x'$ ; and when  $x = x'', y = y''$ , we have therefore two equations of condition:

$$(2) \dots\dots\dots y' = ax' + b, y'' = ax'' + b \dots\dots\dots (3)$$

from whence we obtain

$$a = \frac{y'' - y'}{x'' - x'} = \frac{y' - y''}{x' - x''};$$

and by substituting for  $a$  its value,

$$b = \frac{y'x'' - y''x'}{x'' - x'}$$

Or equation (2) may be subtracted from equation (1), then  $y - y' = a(x - x')$ ; and substituting for  $a$  in this equation its value, as found above, the equation of the line required is

$$y - y' = \frac{y' - y''}{x' - x''} (x - x') \dots\dots\dots (4)$$

in which equation we may observe that when  $x$  becomes  $x'$ , the second term becomes equal to zero, and  $y = y'$ .

If  $y' = y''$ , then  $y = y'$ , or  $y = y''$ , which denotes that the line is parallel to the axis  $AX$ .

If  $x' = x''$ ,  $a = \frac{y' - y''}{0} = \infty$ , the angle which the line makes with the axis is in this case a right one.

### PROBLEM II.

To determine the distance between two given points in a plane.

The distance  $M' M''$  (fig. 5.) is the hypotenuse of the right-angled triangle  $M' M'' m''$ : if it be represented by  $D$ , then  $D = \sqrt{M'' m''^2 + M' m''^2} = \sqrt{(y'' - y')^2 + (x'' - x')^2}$ . If the point  $M$  is at the origin, the co-ordinates  $x' y'$  become nothing, and the preceding expression is reduced to  $D = \sqrt{y''^2 + x''^2} = x'' \sqrt{1 + a^2}$ , because then the equation to the straight line is  $y = ax$ ; and as this also takes place when  $x = x'', y = y''$ , it gives  $y'' = ax''$ .

### PROBLEM III.

To determine the equation of a straight line that shall pass through a given point, and be parallel to a given straight line.

These two conditions are sufficient to determine the two elements of position for the required straight line.

Let the equation of the given straight line be  $y = ax + b$  ..... (1), and that of the line required  $y = a'x + b'$  ..... (2):  $a$  and  $b$  are, in this case, given, and  $a'$  and  $b'$  required. Let  $x', y'$  denote the co-ordinates of the given point; and since this point is in the required line, we have  $y' = a'x' + b'$  ..... (3).

From equation (1) take equation (3), and  $y - y' = a(x - x')$  ..... (4).

The same result may be obtained by taking the value of  $b'$  in equation (3), and substituting it in equation (2). Moreover, the two straight lines being parallel, their trigonometric

tangents are the same, that is,  $a = a'$ : introducing this condition in equation (4), that of the line required will be  $y - y' = a(x - x')$  ..... (5).

If the given point be taken on the given line, then  $y'$  is the value of  $y$ , which corresponds to  $x = x'$ ; and equation (1) becomes

$$y' = ax' + b.$$

Substituting this value of  $y'$  in equation (5), we obtain

$$y = ax + b$$

which shews that the required line and the given line are identical, which is, indeed, self-evident.

### PROBLEM IV.

The equation of two straight lines being given to determine the angle which they make with each other, (fig. 6.) The angles  $CAX, CBX$ , are given, the angle to be found is  $ACB$ . Put  $CAX = \alpha$ ,  $CBX = \alpha'$ ;  $ACB = V$ ,  $\text{tang. } \alpha = a$ ,  $\text{tang. } \alpha' = a'$ ; then  $\alpha' = \alpha + V$ , and  $\text{tang.}$

$V = \text{tang. } (\alpha' - \alpha) = \frac{a' - a}{1 + aa'}$ . If the straight lines are parallel,  $\text{tang. } V = 0$ , and  $a' = a$ ; if they are perpendicular,  $\text{tang. } V = \infty$ , or  $\frac{1}{\text{tang. } V} = 0$ ; therefore  $1 + aa' = 0$ .

### PROBLEM V.

To determine the equation of a straight line that shall pass through a given point, and make a given angle with a given straight line. Let the equation of the given line be  $y = ax + b$  ..... (1) and that required  $y = a'x + b'$  ..... (2)  $a$  and  $b$  are given; from whence  $a'$  and  $b'$  are to be determined by the conditions of the problem. Since the required line is to pass through a point whose co-ordinates are  $x', y'$ , its equation must fulfill when  $x = x'$ , and  $y = y'$ ; hence

$$y' = a'x' + b' \dots\dots\dots (3), \text{ and consequently}$$

$$y - y' = a'(x - x') \dots\dots\dots (4);$$

$b'$  being determined from one of the conditions, it remains to determine  $a'$  from the other. Now,  $m$  being the trigonometric tangent of the angle which the two lines make with each other (by Problem IV.),  $m = \frac{a' - a}{1 + aa'}$ ; hence  $a' =$

$\frac{a + m}{1 - ma}$ . Substituting this value of  $a'$  in equation (4), we have the equation required,

$$y - y' = \frac{a + m}{1 - ma} (x - x') \dots\dots\dots (5).$$

### PROBLEM VI

To determine the condition under which three lines, drawn from the angles of a triangle, will meet in a single point. Let  $x', y'; x'', y''; x''', y'''$  be the co-ordinates of the angles  $D, B, C$  (fig. 7.); the equations to the three straight lines drawn from these angles will be  $y - y' = a'(x - x')$ ;  $y - y'' = a''(x - x'')$ ;  $y - y''' = a'''(x - x''')$ ;  $a', a'', a'''$  being the trigonometrical tangents of the angles which they make with the axis  $AX$ . For these lines to meet in a point, it is requisite that the same system of values of  $x, y$ , should fulfill for the three equations, which is equivalent to finding the value of  $x$  and  $y$  by means of any two of them, and making the result of their substitution in the third

third equal to zero; we thus find the equation of condition

$$a'(y'' - y''') + a''(y''' - y') + a'''(y' - y'') + a'a''(x' - x'') = 0 \quad (1)$$

$$+ a''a'(x'' - x''') + a'''a'(x''' - x')$$

Let us suppose the required straight lines to be perpendicular to the sides of the triangle, and then examine if, upon this supposition, the equation (1) subsists.

The equation to BC is  $y - y'' = \frac{y'' - y'''}{x'' - x'''}(x - x'')$ ; and that of the straight line drawn through D is  $y - y' = a'(x - x')$ .

Now as this latter straight line should be perpendicular to the other, the equation  $aa' + 1 = 0$ , from whence  $a' = -\frac{1}{a}$ , ought to exist between the trigonometrical tangents; but here  $a = \frac{y'' - y'''}{x'' - x'''}$ , therefore  $a' = \frac{x'' - x'''}{y'' - y'''}$ .

The straight line drawn through B being perpendicular to DC, we conclude

$$y - y' = \frac{y'' - y'''}{x'' - x'''}(x - x'), \quad y - y'' = a''(x - x'')$$

and the straight line drawn through C being perpendicular to DB, we have likewise

$$y - y' = \frac{y'' - y'''}{x'' - x'''}(x - x'), \quad y - y''' = a'''(x - x''')$$

Hence the values of  $a'$ ,  $a''$ , are

$$a' = -\frac{x'' - x'''}{y'' - y'''}; \quad a'' = -\frac{x' - x''}{y' - y''};$$

and likewise

$$\left. \begin{aligned} a'a''(x' - x'') &= \frac{(x' - x'')(x'' - x''')(x''' - x')}{(y' - y'')(y'' - y''')(y''' - y')} (y' - y'') \\ a''a'''(x'' - x''') &= \frac{N}{D} (y'' - y''') \\ a'''a'(x''' - x') &= \frac{N}{D} (y''' - y') \end{aligned} \right\} \dots (2)$$

N and D being the numerator and denominator of the fraction which multiplies  $y' - y''$ . By the substitution of all these values the equation of condition is satisfied, for it becomes

$$-(x'' - x''') + x''' - x' + x' - x'' + \frac{N}{D}(y' - y'' + y'' - y''' + y''' - y') = 0 \quad (fig. 8).$$

If the side BC be placed on the axis of the abscissæ, which does not alter the general nature of the results, and also the point B be placed at A, then  $y'' = 0$ ,  $x'' = 0$ ,  $y''' = 0$ , and the equation of condition is simplified, and becomes  $-a'y' + a''y' + a'a''x' - a'a''x'' + a'''a'(x''' - x') = 0 \dots (3)$ . In this position of the triangle,  $a' = -\frac{x'' - x'''}{y'' - y'''} = \infty$ , and in fact the line DR is perpendicular to

AX. If in equation (3) the terms which do not include  $a'$  be suppressed, to express that the tangent is infinite, the equation (3) will be simplified, and expressed, thus,  $a'a''x' + a'a''(x'' - x') = 0$ ; and dividing by  $a'$ ,  $a''x' + a''(x'' - x') = 0$ ; but in this position of the triangle, we have  $a'' = \frac{x'' - x'''}{y'' - y'''}$ ;  $a''' = -\frac{x' - x''}{y' - y''}$ ; and by these values the preceding equation is satisfied.

If from the points A and C lines be drawn to the middle

of the opposite sides, the trigonometrical tangent will be

$a'' = \frac{y''}{x'' - x'}$ ,  $a''' = \frac{y'''}{x'' - 2x''}$ . The substitution of these values in equation (3) will give, after dividing by  $y'$ ,

$$a' \left\{ \frac{x''}{x'' + x'} + \frac{x'' - x'}{x'' - 2x''} \right\}$$

$$= \frac{y''}{x'' + x'} - \frac{y''}{x'' + 2x''} + \frac{y''x''}{(x'' + x')(x'' - 2x'')};$$

from which we deduce  $a' = \frac{-2y''}{x'' - 2x''}$ ; and as this is found to be the value of  $a'$ , that is, of the trigonometrical tangent of the angle which the line DM makes with AX, it may be concluded that this third line passes through the point of intersection of the two first.

Let us consider the perpendiculars drawn from the centres of the sides of the triangle ADC (fig. 9.), the equation

of AD is  $y = \frac{y'}{x'}x$

of DC,  $y - y' = \frac{y'' - y'''}{x'' - x'''}(x - x')$

of AC,  $y = 0$

The equations of the perpendiculars to these sides are,

$$y - \frac{1}{2}y' = -\frac{x'}{y'}(x - \frac{1}{2}x')$$

$$y - \frac{1}{2}y' = -\frac{x'' - x'''}{y'' - y'''}\left(x - \frac{x'' + x'''}{2}\right)$$

$$x = \frac{x'''}{2}.$$

The equation of condition may be immediately formed by determining  $x$  from the two first equations, and employing this value in the third; which ought to be satisfied by this substitution if there exists a point of intersection; now  $x$  is found  $= \frac{x'''}{2}$ ; therefore these three lines intersect in a point.

*Method of determining the Position of a Point in Space.*—Let AX, AY, AZ, be three straight lines reciprocally perpendicular to each other (fig. 10.) at the point A; each of them will be perpendicular to the two others, because it is perpendicular to two straight lines which intersect at its extremity in this plane. Therefore each of these planes will be at the same time perpendicular to the two others. These three planes form then the three faces of a rectangular parallelepipedon, and the solid trihedral angle A. Let us suppose the planes ZAX and ZAY vertical, and the plane YAX horizontal. Let a point in space be represented by M, situated out of the planes ZAX, ZAY, YAX in real position, for example, before the first plane, to the right of the second, and above the third; and let us suppose perpendiculars MM', MM'', MM''' from the point M to these three planes; these perpendiculars will measure the shortest distances from the point to each of these planes. The planes drawn through the perpendicular MM' and MM'', MM' and MM''', MM' and MM''' will enclose the parallelepipedon, and the point M will be the summit of the solid trihedral angle Mepi opposite to the angle A.

The distance MM' from the point M, to the plane ZAX is in real length equal to M'm' or A m'; the distance MM'' from the same point to the plane ZAY is M''m'' or A m''.

and the distance from this point to the horizontal plane Y A X is M M''' or M' m or A m'. Thus these distances may be found on the fixed lines A Y, A X, A Z.

The points M', M'', M''', of the perpendiculars let fall from the point M on the planes to which we refer the position of this point, are called the *vertical* and *horizontal projections* of the point M, *vertical* in considering M' and M'', and *horizontal* when considering M'''.

Two of these projections are sufficient to determine the point; for if from each of them perpendiculars be drawn to the plane which contains it, they will intersect in the point M.

The third projection evidently results from each of the two others, as may be seen in the figure.

Since the position of a point is completely defined by its distance from three rectangular planes of projection, if we denote the distance of the point from the plane Y A Z by  $x$ , the distance of the same point from the plane Z A X by  $y$ , and its distance from the plane Y A X by  $z$ , and the linear values of these distances be denoted by  $a, b, c$ , its position will be indicated by  $x = a, y = b, z = c$ : the formulæ  $x = a, z = c$ , denote the position of the projection M: the formulæ  $y = b, z = c$ , denote the projection M'; and these two projections are sufficient, as we have seen, to find the position of the point; and these two systems of formulæ comprise the data of the three distances. When the point is in the horizontal plane,  $z = 0$ , and its position is fixed by  $x = a, y = b$ : when it is in the plane Z A X,  $y = 0$ , and its position is determined by  $x = a, z = c$ ; and if in the plane Z A Y we have  $x = 0$ , and it is defined by  $y = b, z = c$ .

For a point situated on the axis A X, we have  $z = 0, y = 0, x = a$ .

If on the axis A Y,  $z = 0, x = 0, y = b$ ; and if on A Z,  $x = 0, y = 0, z = c$ .

At A, the origin of these distances, we have  $x = 0, y = 0, z = 0$ .

Every point in the plane, M M' m M''' , and consequently the plane itself, is denoted by  $x = a$ , because  $a$  is the common distance of each of its points from the plane Y A Z.

The plane M M'' m'' M'' is denoted by  $y = b$ , and the plane M M' m' M' is described by  $z = c$ .

The position of these three planes gives that of the point M, and consequently this point will be defined, as we have already said, by the formulæ  $x = a, y = b, z = c$ .

*Of the Equations to a straight Line.*—The equations of a straight line, situated in space, express the relation which exists between the co-ordinates  $x, y, z$ , of any point whatever of the straight line: let us suppose it projected on the planes  $xz$ , and  $yz$ ; these projections will be other straight lines, which have for their equations

$$x = az + \alpha \quad \dots \quad y = bz + \beta$$

eliminating  $z$  from these equations, the resulting equation is  $bx - ay = ba - \alpha\beta$ , which belongs to the plane  $xy$ .

The equations of these three projections, of which any two imply the third, are the equations of the straight line, whose position in space depends on the constant quantities  $a, b, \alpha, \beta$ .

To obtain the co-ordinates of the points in which this straight line cuts the three planes, we must make successively the three values  $x = 0, y = 0, z = 0$ , which gives  $x = \alpha, y = \beta$ , for the point where the straight line intersects the plane

$$xy; \quad z = -\frac{\beta}{b} \quad x = -\frac{\alpha\beta}{b} + z \quad \text{for the point where it}$$

intersects  $xz; \quad z = -\frac{\alpha}{a}, \quad y = \frac{b\alpha}{a} + \beta$  for the point

where it meets the plane  $yz$ .

The straight line, whose equation is  $x = az + \alpha$ , makes, with the axis  $z$ , an angle, whose tangent is  $a$ : it cuts the axis  $x$  in a point, whose distance from the origin of the co-ordinates is equal  $\alpha$ , since, if in this equation  $z = 0, x = \alpha$ .

If two straight lines are situated in the same plane; suppose that of  $x, z$ , then let the equation to the first be  $x = az + \alpha$ , and to the second  $x = a'z + \alpha'$ ; for these straight lines to be parallel,  $a'$  mult =  $a$ , and, if perpendicular,  $1 + a a' = 0$ , or  $a' = -\frac{1}{a}$ .

The equation of two straight lines, situated in space being, for the first,

$$x = az + \alpha, \quad y = bz + \beta \\ x = a'z + \alpha', \quad y = b'z + \beta'$$

the equation, which expresses that these lines meet each other, is  $(z' - \alpha)(b - b') - (\beta' - \beta)(a' - a) = 0$ , which results from the elimination of  $x, y, z$ , from the four equations of the two straight lines.

*Problems relating to a straight Line.*—PROB. I. To draw a straight line through a point given in space parallel to a given straight line. Let the three rectangular co-ordinates be  $x, y, z$ ;  $z$  being supposed vertical; and let the equations of the projections of the straight line on the vertical planes be  $x = az + b, y = a'z + b'$ ; then the equation of the horizontal projection will be  $ay - ax = a'b' - a'b$ .

If  $x', y', z'$ , represent the co-ordinates of the given point, the equations of the required line will be

$$x - x' = a(z - z') \\ y - y' = a'(z - z') \\ a'(x - x') = a(y - y')$$

of which any two imply the third.

PROB. II.

To determine the equation of a straight line drawn through two points given in space. Let  $x', y', z'$ , be the co-ordinates of the first point;  $x'', y'', z''$ , those of the second, the straight line passing through the first point, its equations will be of the form

$$x - x' = a(z - z') \\ y - y' = b(z - z')$$

(See Prob. I. of the plane.)

And since it must pass through the second, its equations must also be

$$x - x'' = a(z - z'') \\ y - y'' = b(z - z'')$$

$a$  and  $b$  being eliminated from their four equations, the equations of the required straight line will be

$$x(z' - z'') = z(x' - x'') + x''z' - x'z'' \\ y(z' - z'') = z(y' - y'') + y''z' - y'z''$$

The co-ordinates of the two extremities of a right line being  $x', y', z'$ , for the first, and  $x'', y'', z''$ , for the second, the distance between the extremities, or length of the line joining them, will be

$$\sqrt{(x' - x'')^2 + (y' - y'')^2 + (z' - z'')^2}$$

PROB. III.

To determine the conditions requisite for two straight lines to meet in space. Let the equations of one straight line be

$$x = az + \alpha \\ y = bz + \beta$$

and of the other

$$x = a'z + \alpha' \\ y = b'z + \beta'$$

# GEOMETRY.

To determine the relation between the elements of position  $a, b, a', b'; \alpha, \beta, \alpha', \beta'$ , eliminate  $x, y, z$ , from the four equations, and  $(a' - a)(b' - b) - (\beta' - \beta)(\alpha' - \alpha) = 0$ .

*Of the Equation to a Plane.*—A plane being given by its intersection with two co-ordinate planes, it may be conceived as generated by one of these lines moving parallel to itself in the direction of the other.

Let  $z = ax + c$ , and  $z = by + c$ , be the equations to the two given intersecting lines, the generating line being parallel to itself, and to the intersecting line on the plane  $xz$ , its equations in any one position will be

$$z = ax + y, y = \beta.$$

But if it should meet the second line, whose equations are

$$\begin{aligned} x &= 0 \\ z &= by + c; \end{aligned}$$

hence this equation of condition

$$b\beta + c = \gamma;$$

from which it follows, that the equation of the generating line of the plane, in any given position, depending on  $\beta$ , are

$$\begin{aligned} z &= ax + b\beta + c \\ y &= \beta. \end{aligned}$$

Eliminating  $\beta$  from these two equations, that of the plane is obtained,

$$z = ax + by + c,$$

in which  $a$  and  $b$  are the tangents of the angles which the intersections of the plane make with the axes  $x$  and  $y$ ;  $c$  is the co-ordinate  $z$ , corresponding to the origin of the ordinates; since, if in the equation of the plane,  $x$  and  $y$  are made  $= 0$ ,  $z = c$ . This equation may be more commodiously expressed by the following form:

$$Ax + By + Cz + D = 0,$$

in which, of the four constant quantities  $A, B, C, D$ , three

$$\text{only are necessary; hence } \begin{cases} -\frac{A}{C} = a \\ -\frac{B}{C} = b \\ -\frac{D}{C} = c. \end{cases}$$

The equation of a plane has been determined from its intersections with the planes of the co-ordinates. These intersections may likewise be determined by the equation to the plane.

Let  $ax + by + c = z$ , make successively  $x = 0, y = 0, z = 0$ , and there result  $\begin{cases} x = 0 \\ ax + by + c = 0 \end{cases} \begin{cases} z = 0 \\ y = 0 \end{cases} \begin{cases} z = 0 \\ x = 0 \end{cases}$

which equations belong to the intersections of the given plane with the three planes  $xy, xz$ , and  $yz$ .

The equation of a straight line, situated in one of the co-ordinate planes, is likewise that of a plane passing through this line, and perpendicular to the plane of the co-ordinates which contains it. When the plane is perpendicular to one of the axes, as  $x$ , its equation is  $x = c$  (constant);  $y = \beta, z = \gamma$ , are the equations of two other planes, one perpendicular to the axis  $y$ , and the other perpendicular to the axis  $z$ .

In the equation to the plane make successively  $\begin{cases} z = 0 \\ y = 0 \end{cases}$ ,

$\begin{cases} x = 0 \\ z = 0 \end{cases}$ ,  $\begin{cases} y = c \\ x = c \end{cases}$ ; values will then be obtained for

$x, y, z$ : which are the distances of the origin of the co-ordinates from the points of intersection of the plane with the axes of the co-ordinates: let the equation to the planes be

$z = ax + ly + c$ , these distances will be  $-\frac{c}{a}, -\frac{c}{b}, c$ .

Two planes which are parallel have parallel intersections; therefore, if the equation to the first plane be

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$$z = ax + by + c$$

$$\text{the second, } z = a'x + b'y + c'$$

the condition of parallelism will be expressed by the equations  $a = a', b = b'$ .

## PROBLEM I.

*Problems relating to a straight Line and a Plane.*—To draw a plane parallel to a given plane, let the equation to the given plane be

$$z = ax + by + d$$

and that of the plane required

$$z = a'x + b'y + d'$$

then the condition of parallelism will be

$$a' = a, b' = b.$$

## PROBLEM II.

To determine the equation of a plane which shall pass through three given points, let the co-ordinates of the given points be

$$1 \dots \dots \dots x', y', z',$$

$$2 \dots \dots \dots x'', y'', z'',$$

$$3 \dots \dots \dots x''', y''', z''',$$

The equation of the plane required being supposed

$$Ax + By + Cz + D = 0$$

the three following conditions are obtained;

$$Ax' + By' + Cz' + D = 0$$

$$Ax'' + By'' + Cz'' + D = 0$$

$$Ax''' + By''' + Cz''' + D = 0$$

from which are deduced the following equations;

$$A = y'(z'' - z''') + y''(z''' - z') + y'''(z' - z'')$$

$$B = z'(x'' - x''') + z''(x''' - x') + z'''(x' - x'')$$

$$C = x'(y'' - y''') + x''(y''' - y') + x'''(y' - y'')$$

$$D = x'(y''z''' - y'''z'') + x''(y'''z' - y'z''') + x'''(y'z'' - y''z')$$

The three co-efficients to determine are  $\frac{A}{C}, \frac{B}{C}, \frac{D}{C}$  from the

same number of equations. If the triangle formed by the straight lines joining the given points be projected on the three planes  $xy, xz, yz$ , the areas of these respective pro-

jections will be  $\frac{A}{2}, \frac{B}{2}, \frac{C}{2}$ , and it will be shewn that  $D$  is six

times the solidity of a pyramid whose base is the triangle in space, and whose vertex is the origin of the co-ordinates.

Let  $x'z'', z''z''', z''z'''$  represent the projections of the above three points on the plane of  $xz$ , the area of the

trapezium  $z''x''x'''z'''$  will be  $\frac{(x' - x'')}{2} + \frac{z'(x''' - x'')}{2}$

the area of the trapezium  $x'z''z''x''$  will be

$$\frac{z''(x'' - x')}{2} + \frac{z'(x''' - x'')}{2}$$

and that of the trapezium  $x'z''z''x''$  will be

$$\frac{z'''(x''' - x'')}{2} + \frac{z'(x'' - x')}{2}$$

From the sum of the two first surfaces, take the last, the difference will be the area of the triangle projected on the

plane  $xz$ , which will be  $t' = \frac{B}{2}$ . In the same manner,  $t$

and  $t''$  representing the projections of the same triangle on the planes  $yz, xy$ , we have

$$t = \frac{1}{2}A, t'' = \frac{1}{2}C.$$

## PROBLEM III.

Given the co-ordinates of a point, and the equations of a straight line, to find the equation of the plane which passes through the straight line and the given point, let

$x', y', z'$  be the co-ordinates to the point;

$$x = az + \alpha$$

$$y = bz + \beta$$

$$b(x - \alpha) = a(y - \beta)$$

} be the equations of the line.

Then

# GEOMETRY.

Then since the plane, whose equation is required, passes through the given point, and likewise through the point where the given line intersects the plane  $xy$ , the co-ordinates to which points are  $z = 0$ ,  $x = \alpha$ ,  $y = \beta$ . If the equation to the plane be supposed

$$z = Ax + By + D,$$

in which  $A, B, D$ , are co-efficients to be determined, then

$$z' = Ax' + By' + D \dots \dots (1)$$

$$0 = A\alpha + B\beta + D \dots \dots (2)$$

Now the right lines being in the plane, suppose them both moved parallel to themselves till the plane passes through the origin of the co-ordinates, the equations there will be, for the straight line,

$$x = ax, y = bz, ay = bx$$

and for the plane  $x = Ax + By$ .

In this position the line is still in the plane, so that their co-ordinates are still the same; therefore,

$$z = Aaz + Bbz, \text{ and } 1 = Aa + Bb \dots \dots (3)$$

The equations 1, 2, 3, will give  $A, B, D$  in terms of  $a, b, \alpha, \beta$ , and the equation of the plane will be

$$(x - x')(y' - bz' - \beta) - (y - y')(x' - az - \alpha)$$

$$+ (z - z') \{ (bx' - \alpha) - a(y' - \beta) \} = 0.$$

### PROBLEM IV.

Given the equations of a straight line, and of a plane to determine the conditions; 1st. that the plane and straight line may be rectangular; 2d. The co-ordinates of the points where they meet; 3d. The distance of this point from a given point, either in the *given line* or given plane.

When a plane is perpendicular to a straight line, the intersection of the plane with the co-ordinate planes and the projection of the line with these same planes are perpendicular to each other.

Let  $x = az + \alpha, y = bz + \beta$ , be the equations to the line;  $z = Ax + By + C$  the equation to the plane; the equations to the intersections of this plane with the rectangular planes of  $xz$ , and  $xy$ , are  $z = Ax + C \dots \dots z = By + C$ , but the plane being perpendicular to the line is  $A = -a, B = -b$ ; therefore the equation of a plane perpendicular to the line, is  $ax + by + z = C$ : combining this equation with those of the straight line  $x = az + \alpha, y = bz + \beta$  we may deduce the values of  $x, y, z$ , the co-ordinates of the point in which the straight line intersects the plane. If the plane is given by the equation  $ax + by + z = C$ , and the perpendicular to it be required to be drawn through a point whose co-ordinates are  $x, y, z$ , the equation to this perpendicular will be  $x - x' = a(z - z') \dots \dots y - y' = b(z - z')$  and the equation to the plane may be expressed in this form

$$a(x - x') + b(y - y') + z - z' = C - ax' - by' - z'$$

Let  $X, Y, Z$ , be the co-ordinates of the point of intersection of the plane and perpendicular, then

$$Z = z' + \frac{C - ax' - by' - z'}{1 + a^2 + b^2}$$

$$Y = y' + \frac{b(C - ax' - by' - z')}{1 + a^2 + b^2}$$

$$X = \frac{a(C - ax' - by' - z')}{1 + a^2 + b^2}$$

The length of the perpendicular comprehended between the points  $X, Y, Z$  and the points  $x', y', z'$  is =

$$\sqrt{(X - x')^2 + (Y - y')^2 + (Z - z')^2}$$

$$\text{or} = \frac{C - ax' - by' - z'}{\sqrt{1 + a^2 + b^2}}$$

Hence it follows that the perpendicular drawn from the origin of the co-ordinates upon a plane whose equation is

$$ax + by + z = C \text{ is expressed by } \frac{C}{\sqrt{1 + a^2 + b^2}}$$

Having the equations of a straight line  $\begin{cases} x = az + \alpha \\ y = bz + \beta \end{cases}$  the equation of a plane perpendicular to this line drawn through the point  $x', y', z'$ , is  $a(x - x') + b(y - y') + z - z' = 0$ .

To find the co-ordinates of the point of intersection of the plane, the equations of the straight line may be put under the following form;

$$\begin{cases} x - x' = az + \alpha - x' \\ y - y' = bz + \beta - y' \end{cases}$$

Let  $X', Y', Z'$ , be the co-ordinates of the points of intersection; then

$$Z = \frac{a(x' - \alpha) + b(y' - \beta) + z'}{1 + a^2 + b^2}$$

$$Y = \frac{b(a(x' - \alpha) + b(y' - \beta) + z')}{1 + a^2 + b^2}$$

$$X = \frac{a(a(x' - \alpha) + b(y' - \beta) + z')}{1 + a^2 + b^2}$$

Substituting for  $X', Y', Z'$ , their values in the radical

$$\sqrt{(X' - x)^2 + (Y' - y)^2 + (Z' - z)^2}$$

an expression is obtained for the perpendicular contained between the given point of the straight line, of which the co-ordinates are  $X, Y, Z'$ . When the straight line passes through the origin of the co-ordinates, its equations become  $x = az$ ,

and the radical  $\frac{y = bz}{\sqrt{X'^2 + Y'^2 + Z'^2}}$  expresses the length of

the straight line, drawn from the origin of the co-ordinates to its intersection with the perpendicular let fall from the point  $x', y', z'$ , upon it: on this supposition,  $z = 0, \beta = 0$

$$Z' = \frac{ax' + by' + z}{1 + a^2 + b^2}; Y' = bz'; X' = az'; \text{ there-}$$

$$\text{fore } \sqrt{X'^2 + Y'^2 + Z'^2} = \frac{ax' + by' + z'}{\sqrt{1 + a^2 + b^2}}$$

This expression is used in finding the angle which two straight lines make with each other.

4. The equation of two straight lines being given to find the angle which they make with each other, and if they do not intersect each other to determine the angle which their projections form on a plane that is parallel to them, let the equations of the given lines be

$$1^{\text{st}} \begin{cases} x = az + \alpha \\ y = bz + \beta \end{cases}$$

$$2^{\text{d}} \begin{cases} x = a'z + \alpha' \\ y = b'z + \beta' \end{cases}$$

If they intersect, the angle which they make is equal to the angle formed by their parallels which pass through the origin of the co-ordinates; the equations to their parallels

being  $\begin{cases} x = az, y = bz \\ x = a'z, y = b'z \end{cases}$ . If a point be taken on the

second parallel, whose co-ordinates are  $x', y', z'$ , and a perpendicular be let fall from this point to the first parallel; then in the right-angled triangle formed by this perpendicular, and by the straight lines drawn from the origin of the co-ordinates to the two extremities of this perpendicular, there are given the two sides which contain the required angle; the expression for one of these sides is

$$\sqrt{a'^2 + b'^2}$$



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$\sqrt{x'^2 + y'^2 + z'^2}$ , the other, as found in the preceding problem, is  $\frac{ax' + by' + z'}{\sqrt{1 + a^2 + b^2}}$ .

Therefore the cosine of the required angle is equal

$$\frac{ax' + by' + z'}{\sqrt{1 + a^2 + b^2} \times \sqrt{x'^2 + y'^2 + z'^2}}$$

But  $x' = az'$ ,  $y = bz'$ ; therefore the cosine of the angle formed by the two given straight lines

$$\frac{1 + aa' + bb'}{\sqrt{1 + a^2 + b^2} \times \sqrt{1 + a'^2 + b'^2}}$$

It appears from this expression, that when two straight lines have for their equations

$$\begin{cases} 1 \dots \dots \dots x = az, y = bz \\ 2 \dots \dots \dots x = a'z, y = b'z \end{cases}$$

if they are perpendicular to each other, the following equation of condition will be obtained,  $1 + aa' + bb' = 0$ , which equation may be likewise obtained directly as follows: the plane perpendicular to the first line drawn through the origin of the co-ordinates has for its equation  $ax + by + z = 0$ . But the perpendicular to the first straight line must be contained in the plane perpendicular to it; therefore the equations to the perpendicular  $x = az'$ ,  $y = b'z$ , and the equation of the plane must subsist at the same time; therefore  $1 + aa' + bb' = 0$ . The angle of the two planes may be thus determined. Let  $ax + by + z = C$ ,  $a'x + b'y + z = C$  be the equations of the planes; these make with each other the same angle as the straight lines which are perpendicular to them, and which are drawn from the origin of the co-ordinates; therefore the cosine of the angle formed by the two given planes, is

$$\frac{1 + aa' + bb'}{\sqrt{1 + a^2 + b^2} \times \sqrt{1 + a'^2 + b'^2}}$$

If the angle be required between one straight line and one plane, then suppose a parallel drawn to the given lines through the origin of the ordinates, and a perpendicular to the plane, the angle contained between these two straight lines will be the complement of the required angle; and consequently, the cosine of the angle of the two lines is the sine of the angle required.

The straight line, whose equations are  $x = az$ ,  $y = bz$ , makes with the axes  $x$ ,  $y$ ,  $z$ , angles whose cosines are

$$\frac{x}{\sqrt{x^2 + y^2 + z^2}}, \frac{y}{\sqrt{x^2 + y^2 + z^2}}, \frac{z}{\sqrt{x^2 + y^2 + z^2}}$$

$$\frac{a}{\sqrt{1 + a^2 + b^2}}, \frac{b}{\sqrt{1 + a^2 + b^2}}, \frac{1}{\sqrt{1 + a^2 + b^2}}$$

The same expressions are the values of the cosines of the angles which a plane perpendicular to the straight line, and whose equation is  $ax + by + z = 0$ , makes with the co-ordinate planes  $xy$ ,  $yz$ ,  $xz$ . If the equation of the plane is  $Ax + By + Cz + D = 0$ , the cosines of the angles which it makes with the co-ordinate planes are

$$\frac{A}{\sqrt{A^2 + B^2 + C^2}}, \frac{B}{\sqrt{A^2 + B^2 + C^2}}, \frac{C}{\sqrt{A^2 + B^2 + C^2}}$$

and the expression found above for the perpendicular, let fall from the origin of the co-ordinates on the plane, becomes

$$\frac{D}{\sqrt{A^2 + B^2 + C^2}}$$

It has been already remarked, that if  $T$  be the triangle formed by the three lines which join, two and two, the three given points, and  $t$ ,  $t'$ ,  $t''$  its projections on the

co-ordinate planes, then  $t = \frac{1}{2} A$ ,  $t' = \frac{1}{2} B$ ,  $t'' = \frac{1}{2} C$ ;  $\frac{D}{6}$  being the solidity of a pyramid which has for its base the triangle  $T$ , and whose vertex is the origin of the co-ordinates. Now the solidity of this pyramid is the product of the base  $T$ , by one third of its height  $\frac{D}{\sqrt{A^2 + B^2 + C^2}}$ ; there-

fore  $\frac{D}{6} = T \times \frac{D}{3\sqrt{A^2 + B^2 + C^2}}$ , or substituting for  $A$ ,  $B$ ,  $C$  their values  $2t$ ,  $2t'$ ,  $2t''$ ,  $T^2 = t^2 + t'^2 + t''^2$ .

If  $S$  be the area of another triangle whose projections are  $s$ ,  $s'$ ,  $s''$ , and situated in the same plane as the triangle  $T$ ; then  $S^2 = s^2 + s'^2 + s''^2$

Since  $T = \frac{1}{2} \sqrt{A^2 + B^2 + C^2}$ ,  $\frac{T}{t} = \frac{1}{\left(\frac{A}{\sqrt{A^2 + B^2 + C^2}}\right)}$

in like manner  $\frac{T}{t'} = \frac{1}{\left(\frac{B}{\sqrt{A^2 + B^2 + C^2}}\right)}$ ;  $\frac{T}{t''} = \frac{1}{\left(\frac{C}{\sqrt{A^2 + B^2 + C^2}}\right)}$

which signifies that any triangle is

to its projection on one of the co-ordinate planes, as radius is to the cosine of the angle which the plane of the triangle makes with the plane on which it is projected.

But the triangle  $S$  being in the same plane with the triangle  $T$

$$\frac{t}{T} = \frac{s}{S}, \frac{t'}{T} = \frac{s'}{S}, \frac{t''}{T} = \frac{s''}{S};$$

therefore if the equation  $T^2 = t^2 + t'^2 + t''^2$  be put under this form,  $T = \frac{t}{T} t + \frac{t'}{T} t' + \frac{t''}{T} t''$ , it will become

$$TS = ts + t's' + t''s''; \text{ but } (T^2 + S^2)^2 = T^4 + 2TS + S^4 + t^4 + t'^4 + t''^4 + 2ts + 2t's' + 2t''s'' + s^4 + s'^4 + s''^4; \text{ therefore } (T + S)^2 = (t + s)^2 + (t' + s')^2 + (t'' + s'')^2.$$

Taking in the same manner in the same plane a third triangle  $R$ , whose projections on the rectangular planes are  $r$ ,  $r'$ ,  $r''$ , it may be shewn that  $(R + S + T)^2 = (r + s + t)^2 + (r' + s' + t')^2 + (r'' + s'' + t'')^2$ ; hence if any plane figure whatever be projected on three rectangular planes, the square of the area of this figure will be equal to the sum of the squares of the areas of its three projections.

### PROBLEM V.

Two straight lines being given, 1st, to determine the equations to a straight line perpendicular to each of them on which their shortest distance is measured; 2d, to find an expression for this shortest distance.

The direction of a plane parallel to two straight lines given in position may be determined: this plane being drawn through any point in space, we may conceive a plane to pass through each of the straight lines perpendicular to it: the intersection of these two planes is evidently the line required, therefore the equations to these planes will be those of the line required.

Let  $x = az + \alpha$ ,  $y = bz + \beta$ , be the equations to the first line, it will meet the plane  $xy$  in a point  $P$ , of which the co-ordinates  $z = 0$ ,  $y = \beta$ ,  $x = \alpha$ .

The second straight line having for its equations  $x = a'z + \alpha'$ ,  $y = b'z + \beta'$ , it meets the plane  $xy$  in a point  $P'$ , whose co-ordinates are  $z = 0$ ,  $y = \beta'$ ,  $x = \alpha'$ .

The equations of the planes drawn through the points  $P$  and  $P'$  parallel to the two given straight lines are of the form

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$$A(x - \alpha) + B(y - \beta) + z = 0 \dots\dots (c)$$

$$A(x - \alpha') + B(y - \beta') + z = 0 \dots\dots (c')$$

A and B being two constant quantities determinable by the following equations

$$\left. \begin{aligned} 1 + Aa + Bb &= 0 \\ 1 + Aa' + Bb' &= 0 \end{aligned} \right\} \text{hence}$$

$$A = \frac{b - b'}{ab' - a'b} \quad (1)$$

$$B = \frac{a' - a}{ab' - a'b} \quad (2)$$

The perpendiculars to these parallel planes drawn through the points P, P' have their equations

$$1st \quad x = A z + \alpha; \quad y = B z + \beta$$

$$2d \quad x = A z + \alpha'; \quad y = B z + \beta'$$

The plane drawn through the first of these perpendiculars, and the first given line, has for its equation

$$L(x - \alpha) + M(y - \beta) + z = 0 \quad (E)$$

L and M being given by the two equations

$$1 + LA + MB = 0 \quad (3)$$

$$1 + La + Mb = 0 \quad (4)$$

The equation of the plane drawn through the second perpendicular, and the second straight line is

$$L'(x - \alpha') + M'(y - \beta') + z = 0 \quad (E')$$

L' and M' being determinable by these equations

$$1 + L'A + M'B = 0$$

$$1 + L'a' + M'b' = 0$$

Now each of these last planes contains the required line, therefore the equations of their line of intersection will be those required.

The equations (1) (2) give the values of A and B, and combining them with equations (3) (4) the following values are obtained for L, M, L', M' :

$$L = \frac{a - a' + b(ab' - a'b)}{a(a' - a) + b'(b' - b)}$$

$$L' = \frac{a - a' + b'(ab' - a'b)}{a'(a' - a) + b(b' - b)}$$

$$M = \frac{b - b' - a(ab' - a'b)}{a(a' - a) + b(b' - b)}$$

$$M' = \frac{b - b' - a'(ab' - a'b)}{a'(a' - a) + b(b' - b)}$$

Substituting these values in equations (E) (E') we have

$$(x - \alpha) \left\{ a - a' + b(ab' - a'b) \right\} + (y - \beta) \left\{ b - b' - a(ab' - a'b) \right\} + z \left\{ a(a' - a) + b(b' - b) \right\} = 0;$$

$$(x - \alpha') \left\{ a - a' + b'(ab' - a'b) \right\} + (y - \beta') \left\{ b - b' - a'(ab' - a'b) \right\} + z \left\{ a'(a' - a) + b'(b' - b) \right\} = 0;$$

where the second equation may be deduced from the first by changing  $a, b, \alpha, \beta$  into  $a', b', \alpha', \beta'$ , and  $a', b'$  into  $a, b$ .

From these two equations which represent the required line, its projections on the planes  $yz, xz$ , may be found by successively eliminating  $x$  and  $y$ .

It remains now to determine the absolute length of the shortest distance between the two lines.

If from the origin of the co-ordinates a perpendicular be let fall on each of the parallel planes, these, having the same direction, will become one and the same straight line: their difference, or the distance between the two planes, will be the shortest distance required. The length of these perpendiculars will, by the last problem, be

$$P = \frac{A\alpha + B\beta}{\sqrt{1 + A^2 + B^2}}, \text{ for the plane}$$

$$A(x - \alpha) + B(y - \beta) + z = 0; \text{ D being } = A\alpha + B\beta;$$

$$\text{and } P' = \frac{A\alpha' + B\beta'}{\sqrt{1 + A^2 + B^2}}, \text{ for the plane}$$

$$A(x - \alpha') + B(y - \beta') + z = 0, \text{ where } D' = A\alpha' + B\beta'.$$

$$\text{The difference } P' - P = \frac{A(\alpha' - \alpha) + B(\beta' - \beta)}{\sqrt{1 + A^2 + B^2}}$$

substituting for A and B their values

$$P' - P = \frac{(\alpha' - \alpha)(b' - b) - (\beta' - \beta)(a' - a)}{\sqrt{\left\{ (a' - a)^2 + (b' - b)^2 + (a'b - a'b') \right\}}}$$

When the straight lines meet each other, this distance being nothing,  $(\alpha' - \alpha)(b' - b) - (\beta' - \beta)(a' - a) = c$ ; the same equation, as has been already found, expressing two right lines which intersect each other.

On the transformation of the Co-ordinates.—Given the co-ordinates of a point in relation to three rectangular planes, to determine the co-ordinates of this point, in respect to three other planes.

These three new planes being given in position in respect to three primitive planes, their equations are given.

Let these be, for the

$$1st, \quad Ax + By + Cz + D = 0$$

$$2d, \quad A'x + B'y + C'z + D' = 0$$

$$3d, \quad A''x + B''y + C''z + D'' = 0$$

These three planes intersect each other two by two in three straight lines which are the new axes. The new co-ordinates of the point are measured on the lines drawn through this point parallel to the new axis. The length of any one of these co-ordinates is the part of one of these lines contained between the point, and the plane of the co-ordinates to which this line is parallel.

Let  $x, y, z$ , be the co-ordinates of the point in relation to the primitive planes, and  $u, v, w$ , its co-ordinates in relation to the three new planes. For conciseness let

$$L^2 = \frac{(A'C'' - A''C') + C(B'A'' - B''A')^2}{(C'B'' - C''B')^2 + (A'C' - A''C)^2 + (B'A'' - B''A')^2}$$

$$L'^2 = \frac{(A'C' - A''C) + C'(B''A'' - B''A')^2}{(C'B'' - C''B')^2 + (A'C'' - A''C)^2 + (B'A'' - B''A')^2}$$

$$L''^2 = \frac{(A''C' - A''C) + C''(B'A'' - B''A')^2}{(C'B'' - C''B')^2 + (A'C' - A''C)^2 + (B'A'' - B''A')^2}$$

The values of the new co-ordinates will be

$$u = \frac{Ax + By + Cz + D}{L}$$

$$v = \frac{A'x + B'y + C'z + D'}{L'}$$

$$w = \frac{A''x + B''y + C''z + D''}{L''}$$

If the three new planes be supposed perpendicular to each other, then  $AA' + BB' + CC' = 0$ ;  $AA'' + BB'' + CC'' = 0$ ;  $A'A'' + B'B'' + C'C' = 0$ .

Multiplying the first of these three equations by  $B''$ , the second by  $B'$ , and subtracting, we have  $C(B'' - C'B) - A(B'A'' - B''A) = 0$ . Multiplying the first by  $A''$ , the second by  $A'$ , and subtracting, we have,

$$B(B'A'' - B''A) - C(A'C'' - A''C') = 0.$$

Multiplying the first by  $C''$ , the second by  $C'$ , and subtracting, we have

$$A(A'$$

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$$A(A'C'' - A''C') - B(C'B'' - C''B') = 0.$$

By means of these three equations the expression for L is reduced to  $\sqrt{A^2 + B^2 + C^2}$ .

By a similar calculation,

$$L' = \sqrt{A'^2 + B'^2 + C'^2}; L'' = \sqrt{A''^2 + B''^2 + C''^2};$$

which gives for the new co-ordinates  $u, v, w$ ,

$$u = A'x + B'y + C'z + D' \div \sqrt{A'^2 + B'^2 + C'^2}$$

$$v = A''x + B''y + C''z + D'' \div \sqrt{A''^2 + B''^2 + C''^2}$$

$$w = A'''x + B'''y + C'''z + D''' \div \sqrt{A'''^2 + B'''^2 + C'''^2}$$

The values of  $u, v, w$ , might have been determined directly, since they are the perpendiculars drawn from the points  $x, y, z$ , upon three planes, whose equations are known.

If it be required to transform one system of rectangular co-ordinates into another system likewise rectangular, and having the same origin as the first, the three new axes may be given by the equations of the three new rectangular planes. Of the six constant quantities which enter these equations, three are determined by the condition that the planes are perpendicular to each other, and their values are to be calculated from that which is assigned to the three others; but this calculation may be avoided by determining the position of the new axes by means of any three angles  $\psi, \phi, \gamma$ . This transformation is useful in the application of analysis to mechanics. The following method is that used by La Place in the "Mechanique celeste."

Let the primitive planes be designated by two of the three co-ordinates  $x, y, z$ , which they contain, and the new planes by two of the co-ordinates  $x''', y''', z'''$ .

Let  $\theta$  be the angle of the two planes  $xy$  and  $x'''y'''$ .

$\psi$  the angle which the axis  $x$  makes with the line of intersection of the plane  $x'''y'''$  with the plane  $xy$ .

$\phi$  the angle which this line makes with the axis  $x'''$ .

It is now required to find the values of  $x''', y''', z'''$ , in terms of  $x, y, z$ , and of the three angles  $\psi, \phi, \theta$ .

Let  $x', y', z'$  be the co-ordinates of a point referred to the rectangular axes, reckoned upon the three following lines.  
1. The intersecting line of the plane  $x'''y'''$  with the plane  $xy$ .  
2. The projection of the axis  $z'''$  on the plane  $xy$ .  
3. The axis  $z$ ;

$$\begin{aligned} \text{then } x &= x' \cos \psi + y' \sin \psi \\ y &= y' \cos \psi - x' \sin \psi \\ z &= z'. \end{aligned}$$

Let  $x'', y'', z''$  be the co-ordinates of a point referred to the rectangular axes, reckoned upon the three following lines;  
1. The intersecting line of the plane  $x'''y'''$  with that of  $xy$ .  
2. The perpendicular to this line on the plane  $x'''y'''$ .  
3. The axis  $z'''$ ; then

$$\begin{aligned} x'' &= x'' \\ y'' &= y'' \cos \theta + z'' \sin \theta \\ z'' &= z'' \cos \theta - y'' \sin \theta; \end{aligned}$$

$x''', y''', z'''$  being the co-ordinates of the point relative to the three axes  $x', y', z'$ , we have

$$\begin{aligned} x''' &= x'' \cos \psi - y'' \sin \psi \\ y''' &= y'' \cos \psi + x'' \sin \psi \\ z''' &= z''. \end{aligned}$$

$$\text{Hence } x = \begin{cases} x''' (\cos \theta \sin \psi \cos \phi + \cos \psi \cos \phi) \\ + y''' (\cos \theta \sin \psi \sin \phi - \cos \psi \sin \phi) \\ + z''' \sin \theta \sin \phi \end{cases}$$

$$y = \begin{cases} x''' (\cos \theta \cos \psi \sin \phi - \sin \psi \cos \phi) \\ + y''' (\cos \theta \cos \psi \cos \phi + \sin \psi \sin \phi) \\ + z''' \sin \theta \cos \phi \end{cases}$$

$$z = z''' \cos \theta - y''' \sin \theta \cos \phi - x''' \sin \theta \sin \phi.$$

Multiplying these values of  $x, y, z$  respectively by the co-efficients of  $x'''$  in these values, we have

$$x''' = \begin{cases} x (\cos \theta \sin \psi \cos \phi + \cos \psi \cos \phi) \\ + y (\cos \theta \sin \psi \sin \phi - \cos \psi \sin \phi) \\ - z \sin \theta \sin \phi \end{cases}$$

And by multiplying these values of  $x, y, z$  respectively by the co-efficients of  $y'''$  in these values, and afterwards by the co-efficients of  $z'''$ , we have

$$y''' = \begin{cases} x (\cos \theta \sin \psi \sin \phi - \cos \psi \sin \phi) \\ + y (\cos \theta \cos \psi \cos \phi + \sin \psi \sin \phi) \\ - z \sin \theta \cos \phi \end{cases}$$

$$z''' = x \sin \theta \sin \phi + y \sin \theta \cos \phi + z \cos \theta.$$

Another transformation is sometimes used; a point being referred to three rectangular planes by the co-ordinates  $x, y, z$ , a straight line is drawn from this point to the origin of the co-ordinates; the length of this line is given, as likewise the angles which it makes with the three rectangular axes. If  $r$  represent this line, and  $\alpha, \beta, \gamma$ , the three angles, then  $x = r \cos \alpha, y = r \cos \beta, z = r \cos \gamma$  (1).

Of these three angles two only are necessary; because

$$\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = 1.$$

When the position of a point is thus determined by a line  $r$  and two angles,  $r$  is called the *radius vector*, and the origin of the co-ordinates becomes a pole, from which proceed the *radii vectores* of different points in space.

Sometimes the radius vector is projected upon one of the rectangular planes, suppose on a  $y$ : the angle of the radius, with its projection, is given, as likewise the angle of the projection with the axis of  $x$ , or  $y$ , if  $\psi$  represent the first, and  $\psi'$  the second of these angles,

$$z = r \sin \psi; y = r \sin \psi' \sin \psi; x = r \sin \psi' \cos \psi. \quad (1)$$

If the point, referred to three rectangular planes by the co-ordinates  $x, y, z$ , belongs to a surface, we have between these three co-ordinates an equation,  $F(x, y, z) = 0$ . If the co-ordinates are transformed, and the new ones become  $u, v, w$ , we must substitute in  $F = 0$  for  $x, y, z$ , their values in terms of  $u, v, w$ , and the resulting equation will belong to the new surface referred to the new planes.

If in the equation  $F = 0$ , for  $x, y, z$ , we substitute the values given in equations (1) and (2), it will become what is termed the polar equation to this surface.

When a curve is given by two equations  $f(x, y, z) = 0, f(x, y, z) = 0$ , in substituting in these equations the values given by equation  $F(x, y, z) = 0$ , we obtain an equation to the curve, relating either to three new planes by the co-ordinates  $u, v, w$ , or to a pole, by the *radii vectores*, and their angles.

*Of the centres of surfaces, and of their diametral planes.*—The centre of a surface is defined to be a point, in which all the chords passing through this point are divided into two equal parts.

A diametral plane is that which divides a system of parallel chords, each into equal parts.

Hence, if a surface has a centre, all the diametral planes which it can have, necessarily pass through this centre.

Having given the algebraic equation of a surface, to determine, 1st, if it has a centre; 2d, if it has a diametral plane.

If the proposed surface has a centre, let it be referred to three planes, the origin of whose co-ordinates is the centre itself.

Any straight line drawn through the origin of these co-ordinates will be a diameter, and will cut the surface in two points, the co-ordinates of the first being  $x, y, z$ , and of the second  $-x, -y, -z$ . Therefore, the equation to the surface must subsist in taking  $x, y, z$ , positive or negative; to satisfy this condition, the sum of the exponents of the three co-ordinates in every form must be the same in every parity as the number which expresses the degree of the equation proposed, that is; if even, even, if odd, odd. Thus,

if  $\varphi(r, s, t) = 0$  be the equation to the surface referred to, any three planes, then, in this equation make

$$r = x + a, s = y + b, t = z + c;$$

and an equation of the surface will be obtained in terms of  $x, y, z$  referred to three new planes parallel to the first, and passing through the point supposed to be the centre of the surface: if, by the three particular values assigned to  $a, b, c$ , the terms can be made to disappear, in which the sum of the exponents of the three co-ordinates are of a different denomination as to even or odd, then the degree or dimension of the equation  $\varphi(r, s, t) = 0$ , the proposed surface will have a centre.

*Of diametral Planes.*—When, in all the terms of an equation of a surface, the exponent of one of the co-ordinates is an even number, the plane of each of the other co-ordinates divides the surface into two equal and similar parts.

The equation being  $\varphi(x, y, z)$ , if in all its terms the exponent of  $z$  is an even number, the plane of  $x$  and  $y$  will be a diametral, for it will give for  $z$  a value  $\alpha$ , function of  $x, y$ , and constant quantities, and  $z = \alpha$  will satisfy this equation; therefore, to the same values of  $x$  and  $y$ , two values of  $z$  will correspond, differing only in the sign; therefore the plane of  $x, y$  will be diametral, and for the same reason the two other planes of the co-ordinates will be diametral; when in each term the exponents of  $x, y$  are even numbers.

Let  $\varphi(r, s, t) = 0$  be the equation of the proposed surface; by the transformation of the ordinate, the surface may be referred to three new planes, then  $A r + B s + C t + D = 0$ ;  $A' r + B' s + C' t + D' = 0$ ;  $A'' r + B'' s + C'' t + D'' = 0$ ; in which equation there are nine constant quantities.

The surface proposed has diametral planes, when, by assigning real and particular values to these constant quantities, the terms in which the exponents of the co-ordinates which are odd numbers, may be made to disappear. The real root of the equation, obtained by making the co-efficients of these terms equal zero, determine the number of diametral planes.

In considering surfaces of the second degree, great use may be made of these principles, in determining the centres and diametral planes of these surfaces.

*Of Surfaces of the second Degree.*—Let the general equation of the second degree, between three variable quantities  $x, y, z$ , be  $a x^2 + b y^2 + c z^2 + d x y + e y x + f x z + g x + h y + k z + 1 = 0$ . To determine if the surface to which this equation belongs has a centre.

Making  $x = x' + \alpha, y = y' + \beta, z = z' + \gamma, \alpha, \beta, \gamma$  being supposed the co-ordinates of the center, the equation becomes  $a' x'^2 + b' y'^2 + c' z'^2 + d' x' y' + e' y' z' + f' x' z' + g' x' + h' y' + k' z' + 1 = 0$ .

In this equation, which is likewise of the second degree, there are only three terms in which the sum of the exponents of the co-ordinates is an odd number; these terms may be made to disappear, by making their co-efficients equal to zero, which gives  $g' = 0$ ;  $h' = 0$ ;  $k' = 0$ , making this substitution and taking only the terms multiplied by  $x', y', z'$ ,  $2 a \alpha + d \beta + f \gamma + g = 0, 2 b \beta + d \alpha + e \gamma + h = 0, 2 e \gamma + e \beta + f \alpha + k = 0$ .

These equations being linear in  $\alpha, \beta, \gamma$ , these quantities have real values; therefore, surfaces of the second degree have a centre.

If a certain relation be established between the constant quantities  $a, b, c, d$ , &c. this centre may be placed at an infinite distance from the origin of the co-ordinates. In effect, the value of  $\alpha, \beta, \gamma$  are fractions whose common denominator is  $a c^2 + b f^2 + c d - 4 a b c - d e f$ , therefore, when the following equation subsists between the constant quantities of

the general equation of a surface of the second degree, viz.  $a c^2 + b f^2 + c d - 4 a b c + d e f$ ; the co-ordinates of the centre of this surface are infinite. The surface of the second degree has likewise diametral planes, for by transposing the ordinates it may be referred to three new planes, containing nine constant quantities; taking  $u, v, w$  for the new co-ordinates, the general equation becomes  $A u^2 + B v^2 + C w^2 + D u v + E v w + F u w + G u + H v + K w + 1 = 0$ ; exterminating those terms in which the exponent of any one of the co-ordinates is odd, the six following equations are obtained;  $D = 0, E = 0, F = 0, G = 0, H = 0, K = 0$ ; (A). Of nine constant quantities, six only are determined by these equations; hence it follows, that three planes may cut a surface of the second degree in four equal and similar parts in an infinite number of ways; it has therefore an infinity of diametral and conjugate planes, and of these three perpendicular ones, which intersect each other on the three straight lines on which are reckoned the axes of the surface. This property is analogous to that of curves of the second degree, which have an infinity of conjugate diameters, and in these curves there are two conjugate diameters perpendicular to each other, called axes. The three equations which express that the new planes of the co-ordinates are rectangular joined to the six equations (A), determine the nine constant quantities which enter into the equations of these planes.

Taking for granted what however may be demonstrated, that these constant quantities have always real values, we may suppose, that referring the surface of the second degree to its rectangular co-ordinates, its general equation will always be of this form,  $L x^2 + M y^2 + N z^2 - 1 = 0$ . We shall first consider the surfaces comprehended under the general equation, and next the case where the centre is removed to an infinite distance from the origin of the co-ordinates.

Every surface of the second degree intersected by a plane, has for its section a curve of the second degree; for whatever be the planes, it may become, by the transformation of its co-ordinates, one of the planes to which the surface is referred, so that after this transformation, the equation to the surface is still of the second degree; moreover, the equations of the sections made on a surface by the planes of the co-ordinates cannot be of a higher dimension than the equation of the surface, therefore every surface of the second degree cut by a plane has for its section a curve of the second degree likewise.

If the intersecting plane moves parallel to itself, the section remains always similar to itself: its axes remain always parallel, and its centre is always on the same diameter of the surface, which may be thus demonstrated.

The equation of a curve of the second degree may always be reduced to this form,

$$l x^2 + m y^2 + n x y + p = 0.$$

If in this equation  $f x$  and  $f y$  be substituted for  $x$  and  $y$ ,  $f$  being a constant quantity, the new equation which results from this substitution belongs evidently to a curve similar to the first, and similarly situated; it only differs from the first in the constant term, for after having divided all the terms by  $f^2$ , it becomes

$$l x^2 + m y^2 + n x y + \frac{p}{f^2} = 0.$$

Therefore all curves of the second degree, whose equations are of this form, differing only in the constant term, will be similar and similarly situated.

The general equation to a surface of the second degree being

$$L x^2 + M y^2 + N z^2 - 1 = 0,$$

Let

Let the equation of any intersecting plane be

$$z = Ax + By + C.$$

The projection of the intersection of the curve with the surface on the plane  $xy$  will have this equation,

$$x^2(L + NA) + y^2(M + NB) + 2ABNxy + 2ACNx + 2BCNy + NC^2 - 1 = 0$$

If the intersecting plane be supposed to change its position by moving parallel to itself,  $A$  and  $B$  will remain constant, and  $C$  only will change its value; hence it follows that the co-efficients of  $x^2, y^2, xy$ , in the equation of projection, will remain the same, whatever be the value of  $C$ . But by the transformation of the co-ordinates this equation may be reduced to this form;

$$lu^2 + m'v^2 + n'uv + p' = 0;$$

in which equation the co-efficients  $l, m, n'$  only contain  $A$  and  $B$ ;  $p'$  alone being some function of  $C$ . If  $C$  be made to vary, the value of  $p'$  may be supposed to become  $p''$ , and the preceding equation to become

$$lu^2 + m'v^2 + n'uv + p'' = 0$$

which as it only differs from the former in the constant quantity, evidently belongs to a similar curve; hence it may be demonstrated that all parallel sections are similar, and similarly situated. Moreover, the locus of the centres of these sections is in a diameter of the surface.

If in the equation  $Lx^2 + My^2 + Nz^2 - 1 = 0$  we substitute for the co-efficients  $L, M, N$ , the constant quantities  $\frac{1}{a^2}, \frac{1}{b^2}, \frac{1}{c^2}$ ,  $a$  being greater than  $b$ , and  $b > c$ ; it becomes

$$b^2c^2x^2 + c^2a^2y^2 + a^2b^2z^2 = a^2b^2c^2 (E)$$

The advantage of this substitution is to render the sign of each term of the equation independent of the particular values of the co-efficients, and to introduce as constant quantities (in the equations of the sections of the surface by the planes of the co-ordinates) only the principal axes of these sections.

From the different combinations of the signs three distinct cases arise from equation  $E$ ; for a full investigation of which we must refer our reader to the original work from which this article was principally extracted. (Vide Application de l'Analyse a la Geometrie, par M. Monge.)

The three equations are

$$b^2c^2x^2 + c^2a^2y^2 + a^2b^2z^2 = a^2b^2c^2, \text{ or } Lx^2 + My^2 - Nz^2 = 1$$

$$b^2c^2x^2 + c^2a^2y^2 - a^2b^2z^2 = a^2b^2c^2, \text{ or } Lx^2 + My^2 - Nz^2 = 1$$

$$b^2c^2x^2 - c^2a^2y^2 - a^2b^2z^2 = a^2b^2c^2, \text{ or } Lx^2 - My^2 - Nz^2 = 1$$

The former belongs to the ellipsoid and the two others to two different species of hyperboloids.

GEOMETRY, *Characters in.* See CHARACTER.

GEOMETRY, *Spherical.* See SPHERICAL.

GEOMORI, Γεωμορι, in *Antiquity*, the division or class of the ancient Athenians employed in agriculture.

GEONOMA, in *Botany*, from *γεωμορος*, a *setter out*, or *distributor of land*, alluding to the mode of growth of the first species of the genus in question, as hereafter described.

—Willd. Sp. Pl. v. 4. 593.—Class and order, *Monoclea Monadelphia.* Nat. Ord. *Palmæ.*

Gen. Ch.

Eff. Ch. General Spatha double, of two valves. Male, Calyx in three deep segments. Petals three. Filaments six, united into a cylinder.

Female, Calyx and Corolla like the male. Style one, lateral. Stigma of two lobes. Drupa dry, with one seed.

1. *G. pinnatifrons.* "Frons pinnate; the pinnæ abruptly jagged."—Native of the Caracas, in shady woods on the lofty mountain of Buenavista. *Bredemeyer.*—The trunk is simple and slender, an inch in diameter, smooth, rising to

the height of fifteen feet, when, by the power of the wind on its ample foliage, it is blown down, but soon produces new shoots and roots from the top, whence a new trunk springs up to the same height of about fifteen feet, and in its turn is quickly laid prostrate like the former. The fronds (rather leaves) are pinnate, their pinnæ irregular, somewhat folded, jagged abruptly at the summit. Spatha double, of two valves, wedge-shaped, somewhat compressed, acute, three inches long. Spadix fifteen inches in length, branched at the top, the branches round, bearing each from seven to nine alternate, cylindrical spikes, of the length of three inches each. Flowers constantly three, sunk in a little hollow of the spike, two of which are male, one female. Drupa dry and fibrous, the size of a pea. Nut globose, black.

2. *G. simplicifrons.* "Frons simple, wedge-shaped, cloven."—Found at the Caracas with the former. *Bredemeyer.*—The trunk of this is permanently upright, ten feet high, an inch thick. Fronds (or leaves) a foot long, simple, wedge-shaped, taper at the base, cloven, and divaricated at the summit, supported on very long stalks. Spatha double, of two valves. Spadix bearing at its extremity three or four cylindrical spikes. Flowers immersed in little cavities, like the former. *Willdenow.*

GEOPONIC, something describing or relating to agriculture. Cato, Varro, Columella, Palladius, and Pliny, are sometimes called geponic writers.

GEORG, ST., in *Geography*, a town of Germany, at the conflux of the rivers Teya and March, formerly a royal city, but now much reduced; 24 miles N.N.E. of Preiburg.—Also, a town of Hungary; 7 miles N.N.E. of Preiburg.

GEORGE, in *Biography*, furnished the Cappadocian, was made bishop of Alexandria when Athanasius was driven from that see by the persecutions of the emperor Constantius, about the year 355. (See ATHANASIUS.) He was a native of Epiphania, in Cilicia, where his father pursued the business of a fuller. From this obscure situation the son raised himself, it is said, not by the most honourable means, to the station of a prelate in the church. At first he obtained a lucrative appointment as purveyor of bacon to the army; not contented with the regular profits of his office, he made use of every art, however base and corrupt, in the accumulation of wealth; so as to render a mean employment truly infamous. His depredations on the public purse became so notorious, that he felt it extremely dangerous to wait the issue of a suit commenced against him. He fled from the pursuit of justice, and contrived to take with him his ill-gotten wealth. The place of his retreat was Alexandria, where he professed great zeal for the Arian system of theology, and being a man of superior talents, he acquired considerable influence with his disciples in that city. Here he collected a large and very valuable collection of books, which the emperor Julian afterwards made the foundation of the noble library established by him in the temple erected in honour of the emperor Trajan, but which was burnt by the connivance of the emperor Jovian. When Athanasius was driven from Alexandria, George was elected bishop by the prevailing party. In this station his conduct was in the highest degree cruel and oppressive. He persecuted the Catholics with an unrelenting hand, and the other inhabitants of this vast diocese were objects of his tyranny and avarice. The merchants he impoverished by unjust monopolies and cruel taxes; the Pagans, who had been excited with the hopes of freedom and toleration, did not escape his rapacity, and the rich temples of Alexandria were either pillaged or insulted by him, who exclaimed, in a haughty and threatening tone of voice, "How long will these sepulchres be per-

nuted

## G E O R G E.

mitted to stand." The people endured all these acts of oppression till their patience was exhausted; they then rose as one man, and expelled him the city. With much difficulty he regained his authority, which he held till the year 362, when the accession of Julian to the empire was the signal for the downfall of the bishop. He, and two other persons, who had been ministers of his atrocities, were ignominiously dragged in chains to the public prison. Here, after a confinement of a few days only, they were attacked by the Pagan populace, who forced open the doors of the dungeons, and with cruel insults massacred the vile wretches. Their lifeless bodies were carried in triumph through the streets on the back of a camel, and after having suffered every indignity, they were thrown into the sea, with the avowed intention of disappointing the devotion of Christians, who, they foresaw, would gladly canonize the tyrant as a martyr and saint. The fears of the Pagans were just, but their precautions ineffectual. The meritorious death, as it was denominated, of the prelate, obliterated the memory of his life, and the infamous George of Cappadocia has been transformed into the renowned St. George of England, the patron of arms, of chivalry, and of the garter. The saints of Cappadocia, Basil, and the Gregories, did not acknowledge their companion, and pope Geladius, about the year 494, is the first Catholic who acknowledges St. George, and who placed him among the martyrs of the churches. He rejects his acts as spurious, and as the composition of heretics. His fame and popularity in Europe, and especially in England, proceeded from the crusades. Gibbon, vols. iii. and iv. Moreri.

GEORGE of *Trebisond*, a learned modern Greek, was born, in 1395, in the isle of Crete, of a family originally from Trebisond, from which he derives his name. He came to Italy about 1420, and obtained the patronage of Francis Barbaro, a noble of Venice, through whose means he was invited to a professorship of Greek at Vicenza. Thence he removed to Venice, where he acquired great reputation as a grammarian and instructor in Grecian eloquence. After this he obtained an invitation from pope Eugenius IV. to settle at Rome, and, during the life of the pontiff, he was occupied in teaching rhetoric and philosophy, and in translating several ancient Greek authors into Latin. He was engaged in a similar manner by pope Nicholas V., under whose patronage George might have lived happily, had not his own temper involved him in many disputes with the learned men about the papal court. With Poggio he came to blows, and it was necessary to resort to the authority of the apostolic secretaries to part them. His own conduct at length forced him from Rome, and he took refuge, in 1452, at Naples, where he was graciously received by king Alphonso, but he did not partake of his liberality, and had great difficulty, at this period, in maintaining his family. It is supposed, that by the interference of his friend Filelfo, he was reconciled to the pope, and that he returned to the papal city: but in 1459 he was at Venice, where he presented to the doge his version of Plato's book on laws, and was then engaged as a professor of belles lettres. In 1464 he went to Crete, and passed thence to Constantinople. On his return he found his own scholar Paul II. on the papal throne, which led him to visit Rome, but his treatment there did not, probably, correspond with his expectations; he was, for some offence not known, cast into prison, where he was kept during a space of four months. He died about the year 1480. He lived to a good old age, and was author of many works on rhetoric and subjects connected with polite literature; and he translated many others, particularly of the fathers, from the Greek into the Latin. He is esteemed very highly for the share which he had in intro-

ducing Greek literature into the West. His Latin style was far from pure; and in controversy he dealt much in invective. The comparison which he instituted between Aristotle and Plato gave great offence to the adherents of the latter, particularly to cardinal Bessarion, who wrote an answer to him. Gen. Biog.

GEORGE, called also *Amira*, flourished about the close of the 16th century, and was at Rome under the pontificate of Clement VIII. He published "A Syriac and Chaldee Grammar" in 4to. in 1596. He was, after this, elected patriarch of the Maronites, among whom he introduced the use, and explained the principles, of the Gregorian calendar. He died about the year 1641. Moreri.

GEORGE LEWIS I., king of Great Britain, and elector of Hanover, the son of the elector Ernest-Augustus, by Sophia, daughter of Frederick elector-palatine, and granddaughter of James I., king of England, was born in 1660, and trained to the profession of arms under his father. When he had arrived to the state of manhood, he engaged in the service of the emperor against the Turks, and became illustrious as a warrior in three campaigns in Hungary. He next distinguished himself in the war between the empire and France, and in the year 1700 he succeeded, on the death of his father, to the electorate. In the following year he marched to the assistance of the duke of Holstein, who was attacked by the king of Denmark, and obliged the Danes to raise the siege of Tonningen. He joined the alliance against France in the succession war, and forced the princes of the house of Wolfenbuttle to quit their alliance with the French. The command of the army of the empire was conferred upon him in 1707, but after the duties of three campaigns, in which he had been able to act only on the defensive, he resigned his command, and left his own troops in the service of the allies. At the peace of Rastadt, Lewis XIV. recognized the electoral dignity in the house of Lunenburg, as he had before, at the peace of Utrecht, the succession of the same house to the crown of Great Britain. This event happened on the death of queen Anne in 1714, when the prince, now George I., was in the fifty-fourth year of his age. He was already celebrated for the wisdom and justice of his government, and his personal qualities, though limited in his views by the interests of a German prince, and but little acquainted with the character of the nation he was about to rule. "It is evident," says an historian, "that the title of this prince was founded solely on the choice of the parliament, that is, of the people, and that the usual order of succession was entirely superseded. For, admitting the male line of the house of Stuart to have been extinguished in the person of James II., the right of blood rested in the house of Savoy, descended from Henrietta, duchess of Orleans, daughter of Charles I." Thus the rights of the people were fully exercised, and the family on the throne is in truth an elected family, though the general law of succession remains unaltered. The king threw himself into the arms of the Whig party, who, indeed, alone openly maintained those principles upon which the right of his crown was founded. Of these the fundamental one was the superiority of the national will, in appointing a chief governor, to any claim derived from hereditary right. Such a principle had been already assumed, and was the only one that could justify the nation in setting aside the more immediate heirs to the crown, on the plea of difference of religion. (See WHIGS.) As soon as this prince was settled on his throne, the late Tory ministry were called to account for their conduct, particularly with respect to the treaty of Utrecht, and several of the heads of it were impeached, and either imprisoned,



prisoned, or driven into exile. These measures were the cause of great dissatisfaction; tumults were excited in various parts of the kingdom, and at length, in September 1715, the earl of Marr set up the standard of rebellion, and proclaimed, with due honours, the pretender. The plan was ill concerted, and very weakly supported, and early in the following year it was entirely quelled, but several of the leaders lost their lives on the scaffold. Still a large body of the people were disaffected to the new family, and the power of the Tory party was so formidable, that the ministry, to establish their authority, had recourse to septennial parliaments, instead of triennial ones, according to the law of the land. It was agreed by men of all parties, who were not personally interested in the change, that this innovation was a most gross violation of the principles of the constitution, which no temporary necessity could justify. The king had, about this period, acquired by purchase the duchies of Bremen and Verden, in order to extend his power as elector of Hanover. By the acquisition he was involved in a quarrel with Charles XII. of Sweden, who threatened to invade Scotland in favour of the claims of the pretender. The czar Peter also concurred in the scheme. To obviate the danger, the king entered into a triple alliance with Holland and France, a fleet was sent up the Baltic to awe the Swedes, and all commercial intercourse with that nation was suspended: but the death of Charles XII. in 1717, and the subsequent changes in the politics of Sweden, put an end to the alarm in that quarter, and secured George in the quiet possession of his newly acquired continental acquisitions. The ambition of the court of Spain, governed by cardinal Alberoni, disturbed the peace of Europe, and occasioned a quadruple alliance between the three powers above-mentioned, with the accession of the emperor. The seizure of Sardinia, and invasion of Sicily by the Spaniards, gave a pretext for sending a powerful English fleet into the Mediterranean under sir George Byng, who fell in with, and almost totally destroyed the Spanish fleet. This success was followed by the recovery of Sicily and Sardinia, and Spain was under the necessity of acceding to a peace dictated by the allied powers. A pacification of the north of Europe was also effected by the mediation of England. The national delusion and calamity in the year 1720. (see BUBBLE) recalled the king from a visit to his German dominions, and the prudent measures of parliament produced the restoration of public credit. In 1722 a new conspiracy against the government was discovered, and several persons were apprehended in consequence of it, among whom was Dr. Atterbury, bishop of Rochester, who was punished with perpetual banishment. The ministers of France and England, Fleury and Walpole, being friendly to peace, preserved a good understanding between the two countries for many years. Several treaties were negotiated under the pretence of maintaining the balance of power, but usually other private ends were to be answered by them. The leading principle of George I. was the safety and prosperity of his German dominions, to the interests of which, those of Great Britain were, on various occasions, said to be sacrificed. In 1725, a treaty between the emperor and the king of Spain excited the jealousy of king George so much, that he counteracted it by another at Hanover, comprising most of the other European powers, and he sent a fleet to the West Indies under admiral Hoyer, in order to block up the Spanish galleons at Portobello. The death of the admiral and most of his crew from disease, was considered as one of the most inglorious disasters of the reign. The Spaniards then besieged Gibraltar, but all differences were finally settled by a negociation. The king of England seemed at

length to have surmounted all his political difficulties, and a prospect of permanent peace and tranquillity appeared to open upon him. The toil, and dangers, and anxieties which he had felt during his whole reign seemed at last to be rewarded with glory, happiness, and repose. He thought every circumstance was favourable to his visiting his electoral dominions, and embarked for that purpose at Greenwich, June 3, 1727. He landed in Holland on the 7th, but in his journey from thence to Hanover he suffered a paralytic seizure, and feeling that he was near the end of his long journey, he exclaimed to his attendant, "C'est tout de moi." He reached the palace of his brother, the bishop of Osnaburg, but could not advance farther. He died June 11, 1727, in the sixty-eighth year of his age, and the 13th of his reign. He has been characterized as plain and simple in his appearance, grave and sedate in his manner, but easy and familiar among his intimates, in whose society he was fond of relaxing from the cares of the state. He possessed much natural prudence and good sense, and well understood his interests, at least as far as the objects nearest his heart were concerned. Acceding to the crown of Great Britain when far advanced in life, he seemed ever to consider himself rather as elector than as king, and the influence and power of Great Britain were of little estimation in his eyes when directed to any other end than the aggrandizement of his native country. In the view of Europe at large, he sustained the character of a prudent, able, and fortunate prince. His government was not without defects in the administration, but he was unquestionably a zealous friend to civil and religious liberty. He had female favourites, but was not governed by them. He had little or no taste for literature and science, and was unable to appreciate their value, yet he founded in each university a professorship of modern history. He was, however, a lover of music; and soon after his accession established regulations for the conduct of this part of the service in the royal chapel. He had married in 1681, his cousin Sophia Dorothea, daughter of the duke of Zell, a match that was attended with little domestic happiness. He left behind him one son, who succeeded him in his crown.

GEORGE AUGUSTUS II. king of Great Britain, son of the preceding, was born in 1683, and came to England with his father in 1714, where he received the rank and title of Prince of Wales. In 1716, he was appointed regent during the king's absence. After this, on account of some private difference between father and son, the latter lived for some time in a state of estrangement from the court. He succeeded to the throne in 1727, and adopted the same ministers and measures which had governed the nation during the life of George I. He inherited also, in full force, the attachment which his father shewed to the German interests, which swayed the councils of his cabinet, though it was frequently obliged to give way to other considerations. Europe, for some time, was in a state of peace, through the influence of the treaties of Seville and Vienna, the latter of which guaranteed the Pragmatic sanction, or the law by which the female heirs of the emperor Charles VI. were to succeed to the hereditary dominions of Austria. In 1732 Walpole introduced into parliament the financial scheme of a great extension of the excise; but the violent opposition it met with from the nation obliged him to relinquish the object. What the people refused to submit to at that period has been since adopted almost without a murmur. In the year 1737, complaints were made against the government for abridging liberty, by a bill for limiting the number of playhouses, and submitting dramatic writings to the inspection of the lord chamberlain. Disputes had long pre-

vailed between Spain and England, on account of the trade carried on in the West Indies by their respective subjects. In 1739, the matters in debate were compromised by a convention settled by the respective courts, but its terms were so little satisfactory to the traders, that Walpole found himself obliged by their clamours to prepare for hostilities. War was declared, and Portobello taken by admiral Vernon. The war, however, did not turn out so successful as the people expected, so that a clamour was raised against the minister, and sir R. Walpole was obliged to resign in the year 1742. At the same period France, and the other powers in league with her, seemed determined, on the death of the emperor Charles VI., to strip his daughter Maria Theresa of her inheritance, which had been guaranteed to her by the Pragmatic sanction. In defence of her just rights, George sent an English army to the continent, and also a large body of forces from his electorate, who were taken into British pay. The king himself joined the army, which was under the command of the earl of Stair, and displayed great bravery. Victory declared itself in favour of the British, but they were forced to leave their wounded to the care of the enemy. Soon after, the command of the allied army devolved on the king's second son, the duke of Cumberland, who was reckoned very deficient in talents as general of a great army. Under him was lost the bloody battle of Fontenoi in 1744, and the French maintained an undoubted superiority in Flanders during the remainder of the war. In the following year the adherents of the pretender encouraged him to try his fortune by a descent, in the northern part of the kingdom, where he might expect an immediate and decisive declaration to be made in his favour. His son, accordingly, under the protection of the court of France, landed on the coast of Scotland, in the month of July. He was received with much respect and affection, and was immediately joined by several of the clans, with whom he proceeded to the south, enlarging his small army with all those who would join in his cause. At Perth he proclaimed his father king, and immediately after took possession of Edinburgh, defeated a body of the royal troops at Preston Pans, and marched into England, where he had the strongest assurances of being powerfully reinforced. He proceeded to Derby, but found the people no where zealously inclined to support his cause; at length the duke of Cumberland arrived from Flanders, with several English regiments, engaged and defeated the rebels, and thus put an end to the hopes of the pretender, who could no longer be considered as an object of terror or alarm. The government of the house of Brunswick was from this period more firmly established; and it appeared that the greater part of the nation had indissolubly connected the interests of religion and liberty with the support of those principles which called the family of the reigning prince to the throne. In 1748, peace was negotiated, and established by the treaty of Aix-la-Chapelle; this treaty did not correspond with the expectations of the people, but it was welcomed as a relief from the burthens necessarily imposed by a state of warfare. In 1751, the king lost his eldest son Frederic, who had lived a considerable time at variance with his father, but who had made his peace with the court after the dismissal of Walpole. This prince, the father of our present sovereign, was amiable and well disposed, and the fondest hopes had been entertained of the patriotism which he would have exhibited on the throne to which he was heir, and of which he was deprived by an early death. In 1755, a war broke out between Great Britain and France, the events of which, though truly important to the kingdom, are in no great degree connected with the character of the king. To his apprehensions for

the safety of his German dominions, was imputed the alliance formed with the king of Prussia, and the employment of a large force in continental warfare. This was the least glorious part of the public transactions: and during the early years of the contest events were very unfavourable to England; but when, at the demand of the people, the king summoned to his councils the great William Pitt, afterwards earl of Chatham, the tide of success set full in upon the measures of government. The French power in the East Indies was annihilated; and in America the reduction of Louisburg was followed by that of Canada. The island of Guadaloupe, and the British settlement of Senegal, fell under the British dominion, and the famous battle of Minden exalted the reputation of the British soldiery. The navy of England reigned triumphant over the seas, while that of France was reduced to insignificance, from which it never after completely recovered. Notwithstanding all this success the German war was unpopular, and ministers were reproached for the sacrifices which they had made, or were supposed to have made, to the personal wishes of the king. In this state of affairs George II. suddenly died from a rupture of the right ventricle of the heart, which, without any previous illness or suffering, terminated his life on the 25th of October 1760, in his seventy-third year, and in the thirty-third of his reign. During this long period he had experienced many vicissitudes of fortune, but he lived to see himself the most successful of all the English monarchs. He was endowed by nature with an understanding by no means comprehensive, and he had taken little pains to improve and expand his original powers by intellectual cultivation. Equally a stranger to learning and the arts, he saw the rapid increase of both under his reign, without contributing in the remotest degree to accelerate the progress by any mode of encouragement. He was hasty and obstinate in his temper, yet a natural goodness of heart, a love of justice, and an honest openness of disposition, conciliated the affection of his people, and have inspired respect and veneration for his memory. He was a firm friend to the established laws and liberties of the kingdom, and it must be admitted, highly to his honour, that the general principles of his administration, both civil and religious, were liberal and just. Many of the penal statutes, which still remain unrepealed, were in the reign of this prince meliorated, and virtually suspended, by the mildness and equity of the executive government. And he will long be remembered for his declaration, "that during his reign, there should be no persecution for conscience sake." On various occasions he had given signal demonstrations of personal bravery, nor did the general tenour of his conduct afford proofs less striking of his rectitude and integrity. If he cannot be ranked among the greatest, he is certainly entitled to be classed with the most respectable princes of the age in which he lived.

GEORGE. *St.* a name whereby several orders, both military and religious, are denominated. It took its rise from a faint famous throughout all the East, called by the Greeks *Μεγαλομάρτυρ*. q. d. *great martyr*.

On some medals of the emperors John and Manuel Comneni, we have the figure of St. George armed, holding a sword or javelin in one hand, and in the other a buckler, with this inscription; an O, and therein a little P

A, and ΓΕ—ΠΙΟΣ, making O ΑΓΙΟΣ ΓΕΩΡΓΙΟΣ, *O Holy*

*George*. He is generally represented on horseback, as being supposed to have frequently engaged in combats in that manner.

He is highly venerated throughout Armenia, Muscovy, and

and all the countries which adhere to the Greek rite: from the Greek, his worship has long ago been received into the Latin church; and England and Portugal have both chosen him for their patron saint. See *GEORGE* of *Cappadocia*.

*GEORGE*, *St.* is particularly used for an English order of knights, more commonly now called the *order of the Garter*. See *GARTER*.

*GEORGE*, *knights of St.* There have been various orders under this denomination, most of which are now extinct.

The order of *St. George*, at first called the order of the "Golden Angel," is said to have been instituted by Constantine the Great, in the year 312. The collar is composed of fifteen oval plates of gold, richly chased on their edges, and enamelled blue. On 14 of these plates is the cypher of the name of Christ, composed of the Greek capital letters X and P between the two capitals A and O, signifying that Jesus Christ is the beginning and end; but on the centre oval, which is edged with laurel leaves, the cypher X P is placed on a cross patence gules, edged or, and having on its points the letters I. H. S. V.; and pendent from the bottom was the figure of *St. George* killing the dragon. The habit of the knights was a long cloak of sky blue velvet, lined with white silk, tied at the neck with a cord of crimson silk and gold intermixed, terminating at each extremity in a large tassel; on the left breast of the cloak was embroidered the cross of the order.

The order of *St. George* in Austria and Carinthia was instituted, as some say, by Rodolph, count of Habsburg, the first emperor of the house of Austria, about the year 1273 or 1290; or, as others say, by the emperor Frederic III. in order to guard the frontiers of Germany, Hungary, Austria, Carinthia, and Styria, from the inroads of the Turks. The badge of the order was a plain purple cross edged with green.

The order of *St. George* in Burgundy was founded, in the year 1400, by Philbert de Miolans, a gentleman of Burgundy, on account of his having brought from the East some relics of *St. George*, which he deposited in a chapel erected for the purpose, near to the parish church of Rougemont. The badge of the order is a *St. George* on horseback, overthrowing a dragon, similar to that on the collar of the order of the garter. It was worn pendent to a blue ribband tied to a button-hole. Women were admitted into this order.

The order of *St. George* in Austria was re-founded by the last emperor Maximilian, who directed that the badge of the order should be a cross croset botonnée gules, encircled on the upper part with a ducal coronet or, and worn pendent from three chains of gold.

The order of *St. George* at Genoa was instituted in 1472. The doge of Venice is perpetual grand master of the order. The enlign of the order is a plain red cross, worn round the neck, pendent to a ribband.

The order of *St. George* in Rome was founded by pope Alexander VI. in the year 1492. The collar of the order was a gold chain, to which was pendent, in enamel, the figure of *St. George* on horseback, throwing down a dragon, and piercing it with a lance. The badge was a gold cross within a circle of gold, like an open crown.

The order of *St. George* at Ravenna is supposed to have been instituted by pope Paul III. in 1534. It was abolished by pope Gregory in 1572.

The order of *St. George*, defender of the immaculate conception of the blessed Virgin Mary, was instituted at Munich by Albert, elector of Bavaria, in the year 1729, and confirmed by the pope. The person admitted into this order must prove his gentility for five generations both on his mother's and father's side. The badge of the order is a star of eight points; on the centre is enamelled the image of *St.*

*George* on horseback, slaying a dragon; the cross is enamelled blue, and edged with white, and cantoned with a smaller cross, enamelled blue and white; which, pendent to a sky-blue watered ribband, edged with white, is worn scarfwise. On the left breast the knights also wear the same star embroidered, having on the centre a red cross. On festivals they wear a collar composed of oblong plates with crowns at each end, and columns surmounted with globes; each column supported by two lions, holding in their anterior paws scymitars, joined together with lozenge-chains enamelled blue and white: on the oblong plates is the following motto:—"In fide, justitia, et fortitudine."

The military order of *St. George* in Russia, called also the order of "Merit," was instituted by the empress Catharine II. in 1769, has the precedence over that of *St. Anne* of Holstein, and was divided into four classes. The badge is a cross of gold, enamelled white, on the centre of which is a medallion, with the figure of *St. George* slaying a dragon. This is worn pendent to a black ribband edged with orange colour, and two stripes of orange on the black. Those of the first class wear it under their coat, passing from right to left; and on the left breast of their coat is a star wrought in gold, in the shape of a lozenge: on the centre of the star are embroidered the figure of *St. George* and the dragon. Those of the second class wear the badge pendent to a ribband passing round their neck, and a star on their left breast. Those of the third class wear the badge pendent to a narrow ribband which passes round their neck; but they have no star. Those of the fourth class wear the badge pendent at the button-hole of their coats. Each knight of the first class receives an annual salary of 700 roubles = 140*l.*: each of the second class has 400 roubles = 80*l.* per annum; each of the third class 200 roubles or 40*l.* per annum; and each of the fourth class 100 roubles or 20*l.* per annum. The fund of this order, assigned by the empress for the payment of their salaries, and other expences, is 40,000 roubles = 8000*l.* per annum. Of this 1,680 is destined for the first class; and 2000 for each of the remaining three. The number of knights is unlimited. In 1778, the first class, which is confined to commanders in chief, contained only four; the second class comprized only eight knights; the third, forty-eight; and the fourth two hundred and thirty-four. No person can obtain this order without having performed some gallant exploit, or having served in the rank of an officer 25 years by land, or 18 by sea.

The order of *St. George* of Alfama, or the order of *Montefa*, an order of knighthood in Spain. When the order of knights-templars became extinct in Spain, an order was instituted, about the year 1317, to supply their places, in consequence of a permission for that purpose obtained from pope John XXII. at which time *Montefa* in Valencia was selected as a proper place for the residence of the knights. In the following year, James, king of Arragon and Valencia, built at *Montefa* a noble college for their habitation, and dedicated it to *St. George*: and hence the order assumed its appellation of the order of *St. George* of *Montefa*. The habit of this order is a white mantle, on the left breast of which is embroidered a plain red cross. The badge of the order is a plain red cross, enamelled on gold, which is worn scarfwise, pendent to a broad red watered ribband. The order of *St. George* of Alfama, was instituted about the year 1201, at a town of that name in the diocese of Tortosa. In 1509 this order was united to that of *Montefa*, by pope Benedict XIII. and that union was confirmed in the council of Constance.

*GEORGE*, *Religious of the order of St.* Of these there are divers orders and congregations; particularly canons regular of *St. George* in Alga, at Venice, established by authority

## G E O R G E.

of pope Boniface IX. in the year 1404. The foundation of this order was laid by Bartholomew Colonna, who preached, in 1396, at Padua, and some other villages in the state of Venice. Pope Pius V. in 1570, gave these canons precedence of all other religious. Another congregation of the same institute in Sicily, &c.

*St. GEORGE'S Cross.* See **CROSS**.

*GEORGE noble*, a piece of gold, current at six shillings and eight-pence in the reign of king Henry VIII.

*GEORGE Bank*, in *Geography*, a rocky shoal, near the west coast of Sumatra. N. lat. 3° 48'. E. long. 96° 12'.

*GEORGE, Cape*, a cape on the S. coast of Kerguelen's Land. N. lat. 49° 54'. E. long. 70° 13'.—Also, a cape on the W. coast of Newfoundland. N. lat. 48° 28'. W. long. 59° 17'.—Also, a cape on the N. coast of the island of South Georgia. S. lat. 54° 17'. W. long. 36° 32'.—Also, a cape on the coast of Peru. S. lat. 23° 50'.—Also, a cape on the coast of New Holland, discovered on St. George's day by lieutenant Cook, and so called by him. S. lat. 35° 10'. W. long. 208° 51'.

*GEORGE, St., Cape*, a cape on the W. coast of Newfoundland. N. lat. 49° 30'. W. long. 59'.—Also, the southern extremity of New Ireland. S. lat. 5°. E. long. 152° 15'.

*GEORGE Creek*, a town of America, in Alleghany county, Maryland; 152 miles from Washington.—Also, a river of America, which runs into the Potowmack; 12 miles S.W. of Fort Cumberland.

*GEORGE Island*, an island of America, lying between lake Superior and lake Huron. N. lat. 46° 15'. W. long. 84° 20'.

*GEORGE'S Islands*, two islands in the South Pacific ocean, discovered by Commodore Byron in 1765, and so called by him in honour of his majesty. They were again observed by captain Cook in 1774, in the passage from the Marquesas to Otaheite. One of these islands, called by the inhabitants "Tiookea" was of an oval shape, and about 10 leagues in circuit, lying in the direction of E.S.E. and W.N.W., and situated in S. lat. 14° 27' 30", and W. long. 144° 56'. The inhabitants of this, and probably of the other low isles, are of a much darker colour than those of the higher islands, and seem to be of a much more ferine disposition; which captain Cook attributes to their situation. Nature not having bestowed her favours on these low islands with that profusion she has done to some others, the inhabitants are chiefly indebted to the sea for their subsistence; consequently they are much exposed to the sun and weather, and thus become more dark in colour, and more hardy and robust; for without doubt they are of the same nation. They were observed to be stout, well-made men, and on their bodies was marked the figure of a fish;—a very good emblem of their profession. The other island was similar to the former, extending N.E. and S.W. near four leagues, and from five to three miles broad. It lies S.W. by W. two leagues distant from the west end of Tiookea; and the middle is situated in S. lat. 14° 37'. W. long. 145° 10'. The natives of these islands appeared to be armed with long spears and clubs; their aspect and movements were hostile: some of them, however, appeared to captain Cook to manifest a friendly disposition; but they seemed to have no inclination to maintain any intercourse with him. They supplied him with dogs, which were plentiful, and cocoa-nuts, which were the only fruit they saw. These furnished them with almost all the necessaries of life, particularly food, sails, cordage, timber, and vessels to hold water; and with a view to this use of them, their habitations, which were mean low hovels, thatched with cocoa-nut branches, were selected near groves of these trees. Scurvy-grass was obtained in

great abundance. Their canoes, which they are dextrous in navigating, are large and curiously constructed. Commodore Byron observed the shore to be covered with coral, and the shells of very large pearl-oysters; and he conceived that a very profitable pearl-fishery might be established on these islands. The women had a piece of cloth, appearing to be fabricated of the same stuff with their sails, which hung from the waist as low as the knee; but the men were stark naked. Near the huts of these people were buildings, that appeared to be burying-places, from the structure of which it was inferred that they had great veneration for the dead. Fresh water is scarce. Each of these islands has in it a lagoon, or large salt-water lake. The people are much addicted to theft.

*GEORGE Lake*, a lake of East Florida, which is an enlargement of the river St. Juan, or St. John. It is also called "Great Lake," being about 15 miles wide, and generally about 15 or 20 feet deep, except at the entrance, which has a bar with 8 or 9 feet of water. This lake is beautified with two or three fertile islands, the largest of which is about two miles broad, commanding an extensive prospect, bearing evident marks of a large town of the Aborigines, and appearing to have been the chosen residence of an Indian prince.—Also, a lake that lies to the southward of lake Champlain. The portage between the two lakes is one mile and a half. The water of this lake is very clear, and was formerly used by the French in Canada for sacramental purposes, whence the lake was denominated lake "Sacrament." This lake is about 36 miles long, and from one to seven wide. It embosoms more than two hundred islands; or, as some say, three hundred and sixty-five; most of which are barren rocks, covered only with heath and a few cedar, spruce, and hemlock trees and shrubs, and abounding with rattle-snakes. The remains of Fort George stand at the south end of the lake, about 14 miles N. by W. of Fort Edward, on Hudson river. The famous fort of Ticonderoga, which stood on the north side of the outlet of the lake, where it discharges its water into lake Champlain, is now in ruins.—Also, a lake in Upper Canada, situated below the Falls of St. Mary, and N. of Muddy lake; it is about 25 miles long, with very shallow water.

*GEORGE'S Sound.* See **NOOTKA**.

*GEORGE, St.*, the largest of the Bermudas islands, about 15 miles in length and three in breadth, containing about 500 houses, surrounded and defended by a chain of rocks, which extend some way into the sea, so that ships can approach it only in two places, and not without the assistance of an experienced pilot. It is divided into nine parishes or districts. It has a town of the same name, containing a town-house, where the governor, council and magistrates assemble, a handsome church, and a library. N. lat. 32° 40'. W. long. 64° 32'. (See **BERMUDAS**).—Also, a town, or rather village, nearly in the centre of Newcastle county, in the state of Delaware, N. America; situated on a creek of the same name, which falls into the Delaware river four miles below it, and a little above Reedy island; 45 miles S.W. of Philadelphia.—Also, a town and capital of the island of Grenada, and also one of its six parishes, formerly called by the French "Fort Royale." It is situated in a spacious bay, on the west side of the island, not far from the south end, and possesses one of the safest and most commodious harbours in the English West Indies, which has been lately fortified at a great expence, and being one of the ports of entry belonging to the island was made a seaport by 27 Geo. III. c. 27. The town of St. George is built chiefly of brick, and makes a handsome appearance. It is divided by a ridge, which, running into the sea, forms

on one side the carenage, and on the other the bay.—Accordingly here is the “Bay-town,” which has a handsome square and market-place, and the “Carenage-town,” in which the principal merchants reside; the ships lying landlocked, and in deep water close to the wharfs. On the ridge between the two towns stands the church, and on the promontory above it is a large old fort, which was probably constructed by the first French inhabitants. It is built of stone, and is large enough to accommodate an entire regiment. N. lat.  $12^{\circ} 4'$ . W. long.  $61^{\circ} 31'$ . Edwards's West Indies, vol. ii.—Also, one of the Azores islands, about 10 leagues in length, and two in breadth. The soil is generally level, except towards the north, where it is rocky and barren; it is elsewhere fertile in corn, and the other necessaries of life. It is chiefly remarkable for a great number of lofty and full-grown cedars, with which the natives carry on a considerable trade. N. lat.  $38^{\circ} 39'$ . W. long.  $28^{\circ}$ .—Also, a town of Hindoostan, on the coast of Malabar; eight miles S. of Cochim.—Also, a sea-port on the island of Sciro. N. lat.  $38^{\circ} 58'$ . E. long.  $24^{\circ} 37'$ .—Also, a small island in the Grecian Archipelago, three miles E. of Milo.—Also, a small island in the Grecian Archipelago, at the entrance of the gulf of Sandarlick. N. lat.  $38^{\circ} 48'$ . E. long.  $26^{\circ} 42'$ .—Also, a small island in the East Indian sea, near the coast of Hindoostan; four miles from Goa.—Also, a town of France, in the department of the Mayne and Loire; 20 miles S.S.W. of Angers.—Also, a large and deep bay on the W. side of Newfoundland. N. lat.  $48^{\circ} 12'$ .—Also, a river of America, or rather an arm of the sea, in Lincoln county and state of Maine, lying about two leagues S.W. of Penobscot bay. This river is navigable for brigs and ships of a large burden up to the narrows; and from thence about four miles higher, to nearly the head of the tide, for sloops and schooners of 80 or 90 tons. It is about half a league wide up to the narrows. The navigation is in winter. This river abounds with all kinds of fish.—Also, a river of St. Mary's county, in Maryland, which is a broad but short creek, having its mouth between Piney point and St. Mary's river on the north bank of the Potowmack; opposite to the island of the same name.

*St. GEORGE'S Bank*, a fishing bank in the Atlantic ocean, in the Massachusetts, E. of cape Cod. It extends from north to south between  $41^{\circ} 15'$  and  $42^{\circ} 22'$  N. lat., and between  $67^{\circ} 50'$  and  $68^{\circ} 40'$  W. long.

*St. GEORGE'S Bay*, a bay of the Pacific ocean, on the S.E. coast of New Ireland, between cape St. George and cape Orford.

*St. GEORGE'S Channel*, that part of the Atlantic ocean which is situated between Ireland and Wales.—Also, a strait of the Pacific ocean between New Britain and New Ireland, 300 miles in length.—Also, a strait between the little Nicobar and Sumbelong isles, in the East Indian sea.

*St. GEORGE'S Island*, a small island in the mouth of the river Potowmack. N. lat.  $38^{\circ} 13'$ . W. long.  $76^{\circ} 34'$ .

*St. GEORGE'S Islands*, a cluster of small islands near the coast of East Florida, opposite to the mouth of the Apalachicola.—Also, small islands in the Atlantic, near the coast of Maine in America. N. lat.  $43^{\circ} 50'$ . W. long.  $68^{\circ} 10'$ .

*St. GEORGE'S Key*, was one of the principal British settlements in the bay of Honduras, taken by the Spaniards during the American war, but retaken by the British soon after. The British settlements on the Mosquito shore, and in the bay of Honduras, were surrendered to the crown of Spain at the Spanish convention, signed at London on the 14th of July, 1786. N. lat.  $17^{\circ} 35'$ . W. long.  $88^{\circ} 43'$ .

*St. GEORGE d'Albora*, an island in the Grecian Archipelago, about seven miles in circumference. N. lat.  $37^{\circ} 28'$ . E. long.  $23^{\circ} 20'$ .

*St. GEORGE de Comiers*, a town of France, in the department of the Isère; nine miles S. of Grenoble.

*St. GEORGE d'Elmina*. See ELMINA.

*St. GEORGES-en-Coufians*, a town of France, in the department of the Loire, and chief place of a canton in the district of Montbrison, 9 miles N.W. of Montbrison. The place contains 1020, and the canton 7271 inhabitants, on a territory of  $207\frac{1}{2}$  kilometres, in 8 communes.

*St. GEORGE d'Esperanche*, a town of France, in the department of the Isère; 18 miles S.E. of Lyons.

*St. GEORGES de Lévéfac*, a town of France, in the department of the Lozère, and chief place of a canton in the district of Florac, 18 miles S.W. of Mende. The place contains 1000, and the canton 2600 inhabitants, on a territory of  $137\frac{1}{2}$  kilometres, in 5 communes.

*St. GEORGES sur Loire*, a town of France, in the department of the Mayne and Loire, and chief place of a canton in the district of Angers; 9 miles S.W. of Angers. The place contains 2,320, and the canton 9951 inhabitants, on a territory of 205 kilometres, in 9 communes.

*St. GEORGES-les-Baillargeaux*, a town of France, in the department of the Vienne, and chief place of a canton in the district of Poitiers. The place contains 1119, and the canton 6027 inhabitants, on a territory of 190 kilometres, in 7 communes.

*St. GEORGE d'Orque*, a town of France, in the department of the Herault; 4 miles W. of Montpellier.

*St. GEORGE de Rantambaut*, a town of France, in the department of the Ille and Vilaine; 9 miles N. of Fougères.

*St. GEORGE in Reith*, a town of Austria, 6 miles S.E. of Waidhoven.

*St. GEORGE am See*, a town of Germany, in the principality of Culmbach, seated on a lake, called the pond of Brandenburg; 24 miles N.N.E. of Bayreuth.

*St. GEORGES des Sept Voies*, a town of France, in the department of the Maine and Loire; 12 miles N.W. of Saumur.

*St. GEORGES-du-Vivère*, a town of France, in the department of the Eure, and chief place of a canton in the district of Pontaudemer; 25 miles N.W. of Evreux. The place contains 830, and the canton 11,733 inhabitants, on a territory of  $95\frac{1}{2}$  kilometres, in 14 communes.

GEORGENBERG, a town of Silesia, in the principality of Oppeln; 40 miles E. of Oppeln. N. lat.  $50^{\circ} 30'$ . E. long.  $18^{\circ} 52'$ .

GEORGENFELD, ST., a town of Saxony, in the circle of Erzgebirg; 18 miles S. of Pirna. N. lat.  $50^{\circ} 40'$ . E. long.  $13^{\circ} 44'$ .

GEORGENTHAL, a town of Saxony, in the principality of Gotha; 6 miles S of Gotha.

GEORGENZELLS, a town of Germany, in the county of Henneberg; 5 miles S.S.E. of Salzungen.

GEORGE-TOWN, a town of America, being the chief and post-town of Suffex county, in the state of Delaware, situated 103 miles S. of Philadelphia, containing about 30 houses, and lately made the seat of the county-courts.—Also, a post-town in Maryland, in Kent county, on the east side of Chesapeake bay, containing about 30 houses; 9 miles from the mouth of the river Sassafras, 65 miles S.W. of Philadelphia.—Also, a post-town of Beaver county, Pennsylvania, on the S.E. side of Monongahela river, at the mouth of George's creek; 16 miles S.W. of Union. In this place are annually built many boats, for the trade and emigration

to the western country.—Also, a post-town and port of entry in Montgomery county, Maryland, and in the territory of Columbia, pleasantly situated on a number of small hills, on the northern bank of Potowmack river, separated eastward by Rock creek from Washington city, and distant 4 miles from the capital, and 8 N. from Alexandria. The houses, which are about 250, are elegant and commodious. The Roman Catholics have established a college in this place, which is in a flourishing state. The town carries on a small trade with Europe and the West Indies; 46 miles S.W. by W. from Baltimore, and 148 S.W. from Philadelphia. N. lat. 38° 55'.—Also, a town and township of Lincoln county, in the state of Maine, situated on both sides of Kennebeck river; incorporated in 1716, and containing 1534 inhabitants. It is entirely surrounded by navigable waters, excepting about two miles of land, which divides the waters of Winnanagee creek, a part of the Kennebeck, from an arm or influx of Casco bay, called Stephen's river. This township contains about 28,000 acres of land, and salt-marsh. Upon this spot the Europeans first attempted in 1607 to colonize New England. It is a part of what was called "Sagadahock;" and the patentees of the Plymouth company began here to lay the foundation of a great state. They sent over for this purpose a number of civil and military officers, and about 100 people. Several misfortunes obliged them to give up the settlement, and in 1608 the whole number who survived the winter returned to England. George-town is 15 miles S. of Pownalborough, and 170 N. by E. from Boston.—Also, a post-town of Georgia, in the county of Oglethorpe, 50 miles S.W. of Augusta, in the midst of a poor country, but indicating prosperity.—Also, a large maritime district in the lower country of South Carolina, situated in the N.E. corner of the State. Horry and Marion districts have lately been taken from this territory, leaving 20,332 inhabitants, of whom 16,860 are slaves.—Also, a post-town, and port of entry, and capital of the last-mentioned district, situated on a spot near which several streams unite their waters, and form a broad water called "Winyaw" bay, 13 miles from the sea. It contains 3 or 400 dwelling-houses, built chiefly of wood. The public buildings are a court-house, gaol, and academy; four churches for episcopalians, baptists, presbyterians, and methodists respectively. The place carries on a small trade with the West Indies; 60 miles N.E. by N. from Charleston, and 681 from Philadelphia. N. lat. 33° 24'. W. long. 79° 35'.—Also, a town of Kentucky, on the Eikhorn; 20 miles E. of Frankfort. N. lat. 38° 7'. W. long. 84° 50'.—Also, a town of New Brunswick, on the river St. John. N. lat. 45° 48'. W. long. 66° 12'.—Also, a town on the east coast of the island of St. John, on the gulf of St. Laurence.—Also, a town of the state of Georgia; 20 miles N. of Waynesborough.—Also, a town of Scotland, in Perthshire, with some barracks, at the end of Loch Rannock; 31 miles N.W. of Perth. N. lat. 56° 41'. W. long. 4° 25'.

GEORGIA, in *Botany*, Ehrhart Beitr. v. 1. 176, so named by that author after his majesty George III. king of Great Britain, when he established, as a new genus, the moss called by Linnaeus *Mnium pellucidum*. All botanists, nevertheless, have preferred the name *Tetraphis*, given by Hedwig. See FRINGE of MOSSES, n. 1. It seems, however, that there ought to be a *Georgia* after Georgi the Russian traveller and botanist. See GEORGINA.

GEORGIA, in *Geography*, a country of Asia, between the Caspian and Black seas, and particularly appropriated to the territory that lies between the Caspian sea and Mingrelia, anciently known by the name of "Iberia." The ancient

Iberia, which lies to the west, is now chiefly the "Immeretia" of European Turkey, on the other side of a branch of the Caucasus. Georgia, or more properly "Gurgustan," including Daghestan and Schirvan, may be considered as constituting the Albania of the ancients; a name, however, that has been applied in different quarters to mountainous regions.

The whole country, which is known by the name of Georgia or Grufinia, is divided into two considerable Christian states. One of these, bounded by the Black sea, consists of the kingdom of "Immeretia," and the principalities of "Mingrelia" and "Gurriel," (which see respectively,) and is now governed by a common prince, who bears the title of czar or czar. Each of these countries had formerly its own ruler, all acknowledging the supremacy of the Grand Sultan, till czar Solomon united them under his authority, and freed them from the paramount Ottomans. Solomon, having upon his accession forbidden the scandalous traffic practised by the nobles of selling their peasants, greatly offended the Turks, who gained by that species of commerce. Being by their intrigues driven from his throne, and compelled to find an asylum in the woods and mountains, he lived like a wild man for sixteen years, in caverns and holes, and frequently, by his personal courage, escaped assassination, until he was re-instated in his dominions by the Russians. This prince, on ordinary occasions, was distinguished from his subjects by riding on an afs, perhaps the only one in Immeretia, and by wearing boots. He had no regular troops, but collected a defultory army of 6000 men, without artillery. These troops were drawn together by the sound of the trumpet; in other respects the prince's orders were issued at the markets, which are held every Friday. One of his servants ascended a tree near the place of meeting, and proclaimed the edict with a loud voice. His subjects were of the Greek religion. Solomon died of the plague in 1784, and was succeeded by his nephew David, who threw himself under the protection of Russia. In 1784 his ambassadors were introduced to the empress at Peterburg, and, in the eastern style of homage, threw themselves on the ground at her feet.

The second Georgian state consists of the principalities of "Karduelia" or "Carduelia," (Kartalinia) and "Kakhetty," which have been long governed by Christian princes, in submission to the Persian empire, but, since the shock sustained by the throne of the Sophis, have rendered themselves independent. Each of these two provinces formerly composed a distinct state; but they have both lately been reduced under the sole sovereignty of prince Heraclius of the Kakhettian dynasty. The state of Karduelia and Kakhetty borders northwards on the Kabarda, eastwards on Daghestan and Schirvan, (which see respectively,) southwards on the Persian Armenia, and westwards on Immeretia. The capital is *Tefflis* (which see). The czar, or prince Heraclius, who is celebrated for his bravery and other great qualities, as well as by the important part which he acted during the disturbances that agitated Persia after the death of Tamas Kuli-Khan, submitted in the year 1783 to the Russian empire, thus voluntarily sacrificing an independence which he seemed to have secured by his exploits; but the advantages of which were richly compensated in the protection he procured by this submission. However, notwithstanding his close alliance with Russia, he was compelled in 1787 to renounce his connection with it, and to acknowledge himself tributary to the Porte; but he died soon afterwards. Within a few years past the Russian interest revived, and prevailed; and in February 1801, Georgia was by a public ukase united to that empire. The Georgians or Grufinians, as they are sometimes



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times called, avoided all commixture with the Tartars, and have distinguished themselves as the most numerous and powerful body of the mountaineers of Caucasus, now for the greatest part subject to the protecting authority of Russia. The inhabitants of Georgia, when it was one kingdom, were Christians, but since the year 1639, they were blended with Mahometans; the king of Persia having conquered and divided the country into two provinces or kingdoms, and having obliged the people to embrace the Mahometan religion. But since they have been under the protection of Russia, they have again avowed themselves Christians, following in part the rights of the Armenian, and in part those of the Greek church. They are represented as the most tractable Christians of the East. The Georgians excel in the use of the bow, and are reputed to be the best foldiers in Asia. The women are celebrated for their beauty, but though they are very handsome they love to adorn themselves with paint, and are not in high estimation for their modesty. As the country produces strong wine, the Georgians are addicted to intoxication, and the women, as well as the men, indulge freely in the use of brandy. The men, it is said, have no virtue but courage; fathers sell their children, and sometimes their wives. According to the laws of war in Turkey, any province which revolts is given up to pillage, and the inhabitants are reduced to slavery. In consequence of this custom, which prevails throughout Asia, Georgia and Circassia supply the market of Constantinople with slaves; though it is said, that the Circassians alone have the honour of being admitted into the bed of the sultan. This supply of female slaves is continually furnished by the Leagues Tartars, who, situated between the Caspian and Black seas, between Georgia and Circassia, are perpetually at war with these two provinces. They carry over to the eastern coast of the Black sea the slaves they have taken, and sell them to the Turkish merchants, who come thither at stated times for this traffic. The inhabitants of this same coast, likewise, seize on their countrymen in the neighbouring villages, and sell them; and children have been sometimes sold by their parents. See CIRCASSIA.

The air of Georgia is dry, very warm in summer, and very cold in winter. Fine weather commences in the month of May, and continues till the end of November. The soil is extremely fertile, provided the ground be watered. The bread and fruits are excellent; and the pastures feed a great number of cattle, fat and lean. The game is of excellent flavour, and the wild hogs are delicate. The inhabitants make wine, which they sell into Armenia and Persia, especially to Ispahan, for the king's table. Silk forms a considerable branch of trade to Erzerum; though the inhabitants are unacquainted with the best method of winding it. In this province there are only four considerable towns; *viz.* Teflis, Gori, Suren and Ali. See PERSIA.

GEORGIA, one of the United States of America, situated between 31 and 35° N. lat. and between 5° and 16° W. long.; extending in length about 600 miles, and in breadth 250; and bounded on the east by the Atlantic ocean; S. by East and West Floridas; W. by the river Mississippi; N.E. and N. by South Carolina, the Tennessee state, or by lands ceded to the United States by South Carolina. Its population is estimated, by the census of 1790, at 82,548 persons; of whom 29,264 were slaves; but the number has since been much augmented. The settlement of a colony between the rivers Savannah and Altamaha became the subject of contemplation in England in the year 1732, with a view to the accommodation of poor people in Great Britain and Ireland, and for the farther security of Carolina. The benevolent and humane proposed to raise a fund for conveying indigent emigrants to this part of America, free of

expense. Their generous project was encouraged by letters patent obtained from his majesty George II. in June 1732; and, in honour of the king, the new province was called "Georgia." A corporation was established for settling the colony, which was to be separated from Carolina by the Savannah; and a large sum of money was raised for the purpose of carrying the liberal and humane design into execution. General Oglethorpe was selected for conducting the emigrants, about 116 in number, to their new abode: and soon after their arrival, in the commencement of the year 1733, they marked the spot, on which Savannah now stands, as the most proper for the foundation of their settlement. Accordingly they proceeded to erect a fort, and a number of small huts, for their defence and accommodation. A treaty of amity was concluded between the settlers and their neighbours, the Creek Indians; and various regulations were framed, for their future government. The number of new settlers from the Highlands of Scotland and from Germany gradually increased; so that in the course of three years, Georgia received above 400 British subjects, and about 170 foreigners. Afterwards several adventurers from Scotland, Germany, and Switzerland followed their countrymen, and contributed to encourage the hopes of the trustees as to the permanence and prosperity of the colony. Several towns were built, and, in 1739, more than 600 people were employed in trading with the Indians for furs and skins. Nevertheless, in 1741, the English government received information that scarcely a sixth part remained of the number of persons who had migrated to Georgia; and those that continued were so much discouraged, that they seemed to be desirous of fixing in a more favourable situation. It was thus found that the system of government, which had been formed for this colony, was highly injudicious and altogether inconsistent with its prosperity. The first use which the proprietors of Georgia made of the unlimited powers with which they were invested, was to establish a system of legislation that made them absolute masters, not only of the police, justice, and finances of the country, but even of the lives and estates of the inhabitants. As great inconveniences had been found to arise in other colonies from large possessions, it was thought proper in Georgia to allow each family only 50 acres of land; which they were not permitted to mortgage, or to dispose of by will to their female issue. This last regulation, however, which made the males only capable of inheritance, was soon abolished; but other restrictions of a discouraging nature still remained. No man was permitted to leave the province without a licence. If any of the lands granted by the trustees were not cultivated, cleared, and fenced round with a wooden fence, or pales six feet high, within 18 years from the date of the grant, such part was to revert to the trustees for the benefit of the colony. It was forbidden to use negroes, to import rum, and to trade with the Indians without a special licence obtained for this purpose. Under these restraints the province languished, and the people complained; till at length the trustees, in the year 1752, surrendered their charter to the king, and it was made a royal government. From this time, till the peace of Paris in 1763, the province struggled under many difficulties; arising from the want of credit with friends, and from the frequent molestations of enemies. The good effects of this peace were sensibly felt, and its annual exports, which in 1752 amounted to no more than about 10,000*l.* sterling, were very much augmented; and its population and agriculture proportionally increased; though under some checks and interruptions from disputes and wars with the Creek Indians. But since a treaty of peace and friendship with the Creek nation was concluded in 1790, the state of Georgia has been rapidly advancing in every kind of improvement.

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Since the revolution, Georgia has been divided into counties, comprehended under two districts, *viz.* the Upper and the Lower; the former includes 15 counties, *viz.* Montgomery, Washington, Hancock, Greene, Franklin, Oglethorpe, Elbert, Wilkes, Lincoln, Warren, Jefferson, Jackson, Bullock, Columbia, and Richmond; the latter contains nine counties, *viz.* Camden, Glynn, Liberty, Chatham, Bryan, McIntosh, Effingham, Scriven, and Burke. The principal towns are Augusta, formerly the seat of government, Savannah, the former capital of the state, Sunbury, Brunswick, Frederica, Washington, and Louisville, which is the metropolis of the state, and where its records are deposited. The principal rivers which water Georgia, are Savannah, which separates it from South Carolina, Ogeechee, which runs parallel with the former, and Alatomaha, which runs parallel with the others. Besides these and their numerous branches, we might mention Turtle river, Little Satilla, Great Satilla, Crooked river, and St. Mary's, which forms a part of the southern boundary of the United States. The rivers in the middle and western parts, belonging to the "Georgia Western territory," will be noticed in another place. All these rivers contain a plentiful supply of various sorts of fish, as rock, mullet, whiting, shad, trout, drum, bass, cat fish, whiting, brim and sturgeon; and the bays and lagoons afford oysters, and other shell fish. The chief lake, or marsh, in this state, is Ekanfanoka, called by some Ouaquaphenogaw, which is 300 miles in circumference. The eastern part of the state, between the mountains and the ocean, and the rivers Savannah and St. Mary's, comprehending a tract of country more than 120 miles from N. to S., and from 50 to 80 E. and W., is level without a hill or stone. At the distance of about 40 or 50 miles from the sea-board, or salt-marsh, the land gradually rises to mountains. The vast chain of the Alleghany or Appalachian mountains terminates in Georgia, 60 miles S. of its northern boundary. From the base of this mountain spreads a widely extended plain, of the richest soil, and in a latitude and climate well adapted to the culture of most productions either of the south of Europe or of the East Indies. In the low country, near the rice swamps, bilious complaints and fevers are very general during the months of July, August, and September; and at the approach of this sickly season, the rich planters, with their families, remove either to the sea-islands or to a more elevated situation, for the benefit of the air. In the winter and spring, pleurisy, peripneumonies, and other inflammatory disorders, produced by colds, are common, and frequently fatal. The winters in Georgia, however, are mild and pleasant; snow is seldom seen, nor is vegetation interrupted by severe frosts. In the hilly country, commencing about 50 miles in some parts, and in others about 100 miles from the sea, the air is pure and salubrious, and the water good and abundant. From June to September the mercury in Fahrenheit's thermometer fluctuates from 76° to 90°; and in winter from 40° to 60°. The most prevailing winds are S.W. and E.; and in winter N.W. The E. wind is warmest in winter and coolest in summer; the S. wind in summer and autumn is damp, sultry, and insalubrious. In the S.E. parts of the state, the trade winds impart their agitation to the atmosphere, and serve to purify and meliorate it. In the lowlands rice is cultivated; and in the interior and hilly parts, wheat and Indian corn, and the other productions common to the northern states, are the objects of agricultural attention. Rice is at present the staple commodity of this state; and the other chief articles of produce are tobacco, wheat and indigo. Georgia also yields cotton, silk, corn, potatoes, oranges, figs, olives, pomegranates, &c. The forests consist of oak, hickory, mulberry, pine, cedar, &c. The whole coast is bordered with islands, of which the principal are Skid-

away, Wassaw, Offabaw, St. Catherines, Sapelo, Frederica, Jekyl, Cumberland, &c. These islands are surrounded by navigable creeks, between which and the main land is a large extent of salt-marsh at a medium four or five miles broad, fronting the whole state, and intersected with creeks, which admit a general inland navigation, between the islands and the main land, from the N.E. to the S.E. corners of the state. The entrances of rivers flowing between these islands, form capacious harbours from three to eight miles broad; communicating with each other by parallel salt creeks. The islands in their natural state are covered with pine, oak, hickory, live oak, and red cedar. The soil is grey, formed by a mixture of sand and black mould; and a considerable part of it is very rich, and yields, by cultivation, good crops of indigo, corn, cotton, and potatoes. The soil of the main land, adjoining the marshes and creeks, resembles that of the islands; except that, which borders on the creeks and river that penetrate far into the interior of the country, and which furnishes the valuable rice swamps. The soil between the rivers, at a greater distance, changes from a grey to red colour; and still more remotely, into the mulatto kind, consisting of a black and red earth. This sort of land is generally strong, and yields large crops of wheat, tobacco, corn, &c. This soil is succeeded by another, nearly black, and very rich. This succession of different soils is uniform and regular, intermixed with occasional veins of different sorts; and stretches, in the order above-mentioned, across this state nearly parallel with the sea-coast, and extends through the several states, nearly in the same direction, to the banks of Hudson river. The culture of cotton is now so much an object of attention in this state as to afford a reasonable expectation, that the states of South Carolina and Georgia may, in a few years, be able to raise more than 10 millions of pounds annually for exportation. With proper attention, most of the tropical fruits would flourish in this state. The south-western part of this state, and the adjoining parts of E. and W. Florida, will, it is conjectured, at some future period, become the vineyard of America. The chief articles of export are rice, tobacco, indigo, fago, lumber, naval stores, leather, deer skins, snake root, myrtle and bees wax, corn, and live stock. The value, in sterling money, of the exports of Georgia, in the year 1755, was 15,744*l.*; in 1772, 121,677*l.*; in 1793, value in dollars, 491,472; in 1792, 458,973; in 1793, 501,383; in 1794, 676,154; in 1796, 950,158; and in 1801, 1,854,951. In 1790, the tonnage employed in this state was 28,540, and the number of American seamen was 11,225. In return for her exports, Georgia receives West India goods, teas, wines, clothing, and dry goods of all kinds: from the northern states, cheese, fish, potatoes, apples, cyder, and frocs. The imports and exports are principally to and from Savannah, which has a fine harbour, and is the chief emporium of the state.

The disposition and character of the inhabitants, collected from various parts of the world, are very much diversified; they are charged with indolence, which is attributed partly to the relaxing heat of the climate, and partly to the want of motives, necessary for exerting industry; they are praised for their friendliness and hospitality to strangers. Their diversions are dancing, horse-racing, cock-fighting, and chiefly hunting. They are reproached with an addictedness to gaming.

The different religious sects of this state are Baptists, Methodists, Presbyterians, Episcopals, Roman Catholics, Quakers, and Jews. The two first are the most numerous, and inhabit the upper part of the state. The Episcopals and Presbyterians are about equal in number; and the Catholics and Jews have each of them one church. The civil con-

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constitution of Georgia was adopted and ratified by a convention of delegates from the people, on the 6th of May, 1789, and is formed upon a plan similar to the federal constitution of the United States. All legislative power is vested in two distinct branches, a senate and house of representatives, both chosen by the people at large, and styled the General Assembly. The members of the senate are chosen for the term of three years, and those of the house of representatives are chosen annually. The senate consists of one member from each county, and the house of representatives of thirty-four members. The executive power is vested in the hands of a governor, who holds his office during two years. Freedom of the press and trial by jury shall remain inviolate, and all persons shall be entitled to the writ of "habeas corpus." All persons shall have the free exercise of their religion, without being obliged to contribute to the support of any religious profession but their own. In each county a superior court is holden twice in every year, in which all causes, civil and criminal, shall be tried, those excepted, which may be subject to the federal court, or such as may by law be referred to inferior jurisdictions. The judges of the supreme court, and the attorney-general, shall have a salary established by law; and hold their commission for three years. In the administration of justice, this state is divided into two districts, called the upper and lower circuit; and there are only two judges appointed to sit in the superior court; each of these judges being appointed to try causes in each circuit. Besides the superior court, there is an inferior court, a court of common pleas established in each county, which sits twice in a year, with five judges, appointed by the legislators. The county courts have a jurisdiction of criminal causes, which can be tried only in the superior court. Besides these there are the sheriff's court, and courts held by the justices of the peace, in every part of the state. The literature of this state, which is yet in its infancy, is gradually advancing towards higher degrees of improvement. For this purpose a college is instituted at Louisville, with liberal endowments; and in subordination to this it is proposed to found academies in every county of the state. This institution is denominated the "University of Georgia." The funds for its support consist of about 50,000 acres of valuable land, together with nearly 6000*l.* sterling in bonds, houses, and town lots in Augusta. Other property also, to the amount of 1000*l.*, has been set apart in each county for erecting and furnishing their respective academies. The fund originally designed to support the literary orphan school, founded by the Rev. George Whitfield, a few miles S. of Savannah, consist chiefly of rice plantations and negroes. On the death of the countess of Huntingdon, to whom Mr. Whitfield bequeathed this property as trustee, the legislature, in the year 1792, passed a law, vesting it in thirteen commissioners, with power to carry Mr. Whitfield's original design into execution; and in compliment to the countess, the feminary is denominated "Huntingdon college."

The middle parts of this state are inhabited by the Muskogee or Creek Indians, the most numerous tribe of Indians within the United States. See CREEKS.

The "Georgia Western Territory" consists of an extensive tract of land, a principal part of which belongs to, and is inhabited by the Creek, Chactaw, Chickasaw, and Cherokee nations of Indians. It is washed by the Mississippi river on the west, and may be considered as extending eastward as far as the Appalachian and Flint rivers. It is intersected by a great number of streams, which run in every direction; the principal are the Yazoo, and Loosa, Chitto, which discharge themselves into the Mississippi, Pearl, Pascagoula, Mobile, Alabama, Tombeckee, Escambia, and Chatta Hatcha, which fall into the gulf of Mexico;

and the Tennessee Bend, with Chuccamaga river, which falls into it from the south-east, water its northern part. Twenty millions of acres of this territory was sold in consequence of an act of the legislature, passed in 1795, to certain companies; and the purchase money, amounting to 500,000 dollars, was paid into the state treasury. This land was afterwards sold at an advanced price, by the original purchasers, to various persons, principally of the middle and eastern states. This transaction produced a great degree of discontent; but the ferment has since subsided; and the termination of the dispute has been a general satisfaction on the part of the purchasers, that the disorderly proceedings of the legislature cannot affect their title, which they conceive to be good against all claims on the part of Georgia. MORSE.

GEORGIA, *New*, or *South GEORGIA*, an island in the South Atlantic ocean, discovered by La Roche in 1675, seen by Mr. Guyot, in the ship *Lion*, in 1756, and more particularly described by captain Cook, who explored it with attention in 1775, described its extent and true position, and named it Georgia, in honour of his majesty. It is situated between 53° 57' and 54° 57' S. lat., and between 38° 13' and 35° 34' W. long. It extends S. E. by E. and N. W. by W., and in that direction is 31 leagues long, and its greatest breadth is about 10 leagues. It seems to abound with bays and harbours, especially on the N. E. coast; but they are rendered inaccessible for the greatest part of the year by the vast quantity of ice; or, at least, it must be dangerous lying in them, on account of the breaking up of the ice-cliffs, by which the coast is bounded, and which rise up perpendicularly in masses of very considerable elevation. When these fall they float about in the sea like detached islands, and in falling make a noise like that of a discharged cannon. The inner parts of the country exhibit an appearance no less savage and horrible than the coast. The rocks raised their lofty summits, till they were lost in the clouds, and the vallies lay covered with everlasting snow. The lands, or rather rocks, bordering on the sea coast, were not covered with snow like the inland parts. The rocks seemed to contain iron. They are of blackish horizontal slate, probably approaching to hornblende. Not a tree was to be seen, nor a shrub even big enough to make a tooth-pick. The only vegetation that could be seen was that of a coarse strong-bladed grass growing in tufts, wild burnet, and a plant like moss, which sprung from the rocks. Seals or sea-bears were numerous, but smaller than those at Staten Land. Several flocks of penguins of a large size were observed, and besides these, the oceanic birds were albatrosses, cormorant gulls, and that sort called by Cook Port Egmont lens, terns, snags, divers, the new white bird, and a small bird like those of the Cape of Good Hope, called yellow birds, which were found to be most delicious food. All the land birds that were seen consisted of a few small larks; but our navigators found no quadrupeds. The dung of one was seen, supposed to have belonged to a fox or an animal of that kind. On the whole coast our voyagers observed neither a river nor a stream of fresh water. They thought it highly probable, that the country has no perennial springs; and that the interior parts, as being much elevated, never enjoy heat enough to melt the snow in such quantities as to produce a river or stream of water. The coast alone receives warmth sufficient to melt the snow, and this only on the N. E. side; for the other, besides being exposed to the cold south winds, is in a great degree deprived of the sun's rays by the uncommon height of the mountains. On the approach of our navigators to Georgia, they first discovered an island in S. lat. 54° and W. long. 38° 23', which was called "Willis's island," which was a high rock of no great extent: east of this, between it and the main, they observ-

ed another island, to which, on account of the number of birds they saw upon it, they gave the name of "Bird Island." This island is of larger extent than the former, lies close to the N. E. point of the main land, which was called "Cape North." After having cleared the passage between these two islands, they pursued their coasting voyage to "Cape Buller," and at length arrived at a bay, which they denominated "Possession bay," situated in S. lat. 54 5' W. long. 37 18, 11 leagues E. of Cape North. The land in which this bay lies, was at first judged to be part of a great continent; but upon coasting round the whole country, it was found to be an island, about 70 leagues in circuit. Between this bay and Cape Buller lies the "Bay of Isles," so named on account of several small isles lying in and before it. The next projecting point was called "Cape Saunders," and beyond this is a large bay, which was named "Cumberland Bay." The next projecting land, which was an island appearing to be the extremity of the coast to the east, was called "Cape Charlotte," and on the west side of it lay a bay, which was named the "Royal Bay," the W. point of it being called "Cape George." These two capes are distant from each other six leagues. The island above mentioned, distant in the direction of S. by E. eight leagues from Cape Charlotte, was denominated "Cooper's Isle," which is a rock of considerable height, about five miles in circuit, and one mile from the main. The coast between them forms a large bay, named "Sandwich Bay." At Cooper's Isle the main coast takes a S. W. direction for the space of four or five leagues to a point which Capt. Cook called Cape Disappointment. Off this are three small isles, the southernmost of which is green, low, and flat, and lying one league from the Cape. Advancing towards the S. W., land opened beyond the Cape, which proved to be an island, and was called "Pickersgill island." In sailing round this island, our navigators were almost continually involved in a thick mist, which led them to apprehend that they might be surrounded with dangerous rocks.—Cook's Second Voyage, vol. ii.

GEORGIA, a township of America, in the state of Vermont and county of Franklin, containing 1068 inhabitants. It is situated on lake Champlain, opposite to the north end of South Hero island, and joins Milton on the south and St. Alban's on the north. The river La Moille traverses the S. E. corner of this township.

GEORGIA, *Gulf of*, a large gulf of the North Pacific ocean, between the continent of North America and Quadra and Vancouver's island; about 120 miles in length from north to south; the breadth varying from 6 to 20 miles. It contains several clusters of islands, and branches off into a

great number of canals, most or all which were examined by Capt. Vancouver and his officers

GEORGIAN PLANET, or GEORGIUM *Sidus*, in *Astronomy*, the name given by Dr. Herschel, the discoverer, to the seventh primary planet of the solar system. It is now generally known, particularly on the continent, by the name of Uranus.

This planet was discovered by Dr. Herschel on the 13th March, 1781. It is supposed that other astronomers have observed it, and inserted it in their catalogues as a fixed star. But Dr. Herschel, when he first saw it, was struck with its appearance, which seemed to differ from that of the neighbouring small stars. He happened to be accidentally engaged in examining the small stars near the feet of Gemini, and he observed one considerably larger than the rest, but it not being quite so brilliant, he suspected that it might be a comet; in consequence of which he observed it with different magnifying powers, from 227, with which he discovered it, to 2010, and found that its apparent magnitude increased in proportion, contrary to what takes place in the fixed stars. He therefore measured its distance from some of the neighbouring fixed stars, and comparing its distance for several nights he found that it moved at the rate of about 2 1/4" in an hour. Dr. Herschel wrote immediately to the Royal Society, that other astronomers might join in observing it; upon which it was found and observed by Dr. Maskelyne, who almost immediately declared that he suspected it to be a planet; and on April 1, he wrote an account of this discovery to the astronomers at Paris, so that it was soon observed by all the astronomers in Europe. Mr. Lexell was then in England, and applied himself to compute the orbit upon the supposition that it was a comet; he therefore, according to the usual manner in such a case, supposed the orbit to be a parabola, and assumed several perihelion distances, 6, 8, 10, 11, 12, 14, 16, and 18 times the earth's distance from the sun, and found that any perihelion distance between 14 and 18, would answer very well to the observations. Boscovich printed a memoir on the subject, in which he shewed that there were four different parabolas in which a body might move, and yet the computed places would agree with the observations which had then been made. Other astronomers, however, found that a circular orbit, whose radius was about 18 times the distance of the sun from the earth, would agree better with the observations; and confirmed Dr. Maskelyne's opinion that it was a planet. Upon the supposition, therefore, of a circular orbit, M. de la Lande proceeded to investigate its magnitude from the following observations. Mem. de l'Acad. Roy. des Sci. 1779.

Time of observation . . . . .	April 25, 1781, at 9° 47'	July 31, 1781, at 15° 33'	Dec. 12, 1781, at 10° 10'
Right ascension observed . . . . .	2 25° 15' 27"	3° 1° 7' 49"	3° 1° 23' 31"
North declination observed . . . . .	23 35 34	23 40 25	23 42 47
Longitude . . . . .	2 25 39 17	3 1 2 7	3 1 16 28
Latitude, north . . . . .	11 36	12 24	14 54
Nutation in longitude . . . . .	+ 10	+ 8	+ 7
Aberration in longitude . . . . .	+ 19	+ 21	- 18
Sun's longitude from the mean equinox . . . . .	1 5 58 53	4 9 7 13	8 21 21 50
Log. of the sun's distance . . . . .	0.003196	0.006272	9.992993

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From these data, M. de la Lande calculated the elements of a circular orbit; but it having been found that the motion did not agree with any possible circle, it became necessary to calculate the elements of an elliptic orbit. When a sufficient number of oppositions had been observed for this purpose, professor Robison of Edinburgh undertook this investigation, a full account of which is given in Edinb. Transf. vol. i. 1788. The observations on which this investigation is founded are as follows:

True Time at Edinburgh.		Longitude.	N. lat.
Dec. 21, 1781,	17' 44' 33"	3' 0' 52' 11"	15' 7"
26, 1782,	8 56 56	3 5 20 29	18 56
31, 1783,	0 46 24	3 9 50 52	22 10
Jan. 3, 1785,	17 28 56	3 14 23 2	25 40
8, 1786,	10 39 31	3 18 57 5	28 52

From which the following elements were obtained:

Mean distance	- - - -	19.08247
Eccentricity	- - - -	0.9006
Periodic time	- - - -	83.359 years
Mean anomaly at the 5th opposition	4' 0" 32' 51"	
Long. of aphelion } forepoch Dec.	11 23 9 51	
Long. of the node } 31, 1783.	2 12 46 14	
Inclination of the orbit	- - - -	0 46 25
Equation of the centre	- - - -	5 26 56 6

The elements, as given by La Place, are as follows:

	Years.	Days.	Hours.	Min.	Seco <sup>n</sup> s.
Sidereal revol.	- - -	84	29	0	0 0
Semi maj. axis or mean distance	- - -	-	-	-	19.183620
Proportion of eccentricity of semi maj. axis for beginning of 1750	- - -	-	-	-	0.046683
Secular variation (—indicates diminution)	- - -	-	-	-	-0.000026228
					Deg. Min. Sec.
Mean longitude at beginning of 1750	- - -	228	33	53.6	
Long. of perihelion 1750	- - -	166	36	48.8	
Sidereal and secular motion of perihelion	- - -	0	4	6.1	
Inclination of orbit to ecliptic 1750	- - -	0	46	26.0	
Secular variation of inclination of orbit to true ecliptic	- - -	0	0	3.0	
Long. of ascending node on ecliptic 1750	- - -	72	37	52.8	
Sidereal and secular motion of node on true ecliptic	- - -	0	57	16.2	

The diameter of this planet is about  $4\frac{1}{2}$  times that of the earth, or 35,112 English miles nearly. When seen from the earth, its apparent diameter, or the angle which it subtends at the eye, is 3".5, and its mean diameter, as seen from the sun, is 4". As the distance of the Georgian from the sun is twice as great as that of Saturn, it can scarcely be distinguished by the naked eye. When the sky however is serene, it appears like a fixed star of the sixth magnitude with a blueish white light, and a brilliancy between that of Venus and the Moon; but with a power of 200 or 300, its disc is visible and well defined. Its arc of retrogradation is  $3^{\circ} 36'$ , and the duration of its retrograde motion 151 days.

This planet is accompanied by six satellites, all of them discovered likewise by Dr. Herchel. The two first, which he saw for the first time in the month of Jan. 1787, proved afterwards to be the second and fourth, the others were discovered some few years later.

The most remarkable circumstance attending these satellites is, that they move in a retrograde direction, and revolve

in orbits nearly perpendicular to the ecliptic, contrary to the analogy of the other satellites, which phenomenon is extremely discouraging when we attempt to form any hypotheses relative to the original cause of the planetary motions.

According to La Place, if we take for unity the semidiameter of the planet, equal to 1".9, supposed seen at the mean distance of the planet from the sun, the distance of its satellites will be as follows:

I.	13.120
II.	17.022
III.	19.845
IV.	22.752
V.	45.507
VI.	91.008

And the duration of their sidereal revolutions

D.	Days.	hrs.	min.	sec.
I.	5.8926	5	21	25 20
II.	8.7068	8	16	57 47
III.	10.9611	10	23	2 47
IV.	13.4559	13	10	56 29
V.	38.0750	38	1	48 0
VI.	107.6944	107	16	39 56

La Place conceives that the first five satellites of the Georgian may be retained in their orbits by the action of its equator, and the sixth by the action of the interior satellites; hence he concludes that the planet revolves about an axis very little inclined to the ecliptic, and that the time of its diurnal rotation cannot be much less than that of Jupiter and Saturn.

*Use of the Tables.*—The general construction of this kind of tables will be explained under PLANET. The manner of calculating the mean longitude of the planet is as follows. Vince's Astronomy, vol. iii.

From Table I. take out the mean longitude, the aphelion, and node, together with the arguments II., III., IV., V., VI., VII., VIII., and place them in an horizontal line. But if the given year be not found in that table, take the nearest year preceding the given year as an epoch, and take out as before.

Under which, from Table II. place the mean motion in longitude of the aphelion and node, with the arguments answering to the number of years elapsed since the epoch, to the given year.

Under these write down (Table III.) the mean motions of the same, for the given month.

Under these write down (Table IV.) the mean motions of the same, for the given day of the month.

Under these write down (Table V.) the mean motions of the same, for hours and minutes.

Add together the numbers in the several columns, rejecting twelve signs, or any multiples thereof, if they occur; and in the arguments, rejecting 10,000 in the arguments IV., VI., and 1000 in the arguments II., III., V., VII., VIII., or any multiples thereof, and you get the mean longitude, the aphelion, and node, and the arguments for the given time.

From the mean longitude of the Georgian subtract the longitude of the aphelion, and you have argument I., or mean anomaly.

With argument I. take out the equation of the orbit in Table VI., together with the secular variation, with their proper signs, except the time be before 1780, in which case the secular variation is to be taken out with a contrary sign, making a proportion for the minutes and seconds of the argument, and you first get the equation; and doing the same for the secular variation, you get the secular variation; then say, 100 : the number of years from 1780 to the given time

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∴ fecular variation above found : fecular variation required. Before 1780 the fecular variation must be taken with a sign contrary to that found in the table. With argument II. take out the equation in Table VII., making a proportion in this and in the following equations, for the intermediate numbers of the arguments. With argument III., take out the equation in Table VIII. With argument IV. take out the equation in Table IX. With argument V. take out the equation in Table X. With argument VI. take out the equation in Table XI. With argument VII. take out the equation in Table XII. With argument VIII. take out the equation in Table XIII. Take the sum of all these equations, regard being had to the signs of the first equation, and of the fecular variation, the signs of the others being positive ; and from it subtract 7' 20", and you get the value of these eight equations ; and this applied with its proper sign to the mean longitude already found gives the longitude of the Georgian in his orbit.

From the longitude thus found, subtract the longitude of the node, and you have argument IX.

With argument IX. enter Table XVII. and take out the reduction to the ecliptic, with its proper sign, making a proportion for the minutes and seconds of the argument : and this applied to the longitude of the Georgian in his orbit, gives his true heliocentric longitude on the ecliptic, reckoned from the mean equinox.

With argument IX. enter Table XVI., and take out the latitude, making a proportion for the minutes and seconds of the argument, and you have the true heliocentric latitude of the planet.

With the mean anomaly enter Table XIV., and take out the radius vector, and correct it by the following Table XV. and you have the true distance of the planet from the sun, that of the earth being unity.

*Example.*—To find the heliocentric Latitude and Longitude of the Georgian, on Nov. 26, 1789, at 16<sup>h</sup> 14', mean Time at Greenwich.

	Longitude.				Aphelion.			Node.			Arguments.								
	S.	D.	M.	S.	S.	D.	M.	S.	S.	D.	M.	S.	II.	III.	IV.	V.	VI.	VII.	VIII.
Epoch for 1789	4	6	12	41.4	11	17	11	8	2	12	48	5	618	232	0159	885	0825	949	563
November													18	8	85	27	15	60	50
26'				3 34 39.8				44				13				2	1	5	4
16'				18 21.6				4				1				7	2		
14'				28.2															
				.4															
<b>Sum</b>	<b>4</b>	<b>10</b>	<b>6</b>	<b>11.4</b>	<b>11</b>	<b>17</b>	<b>11</b>	<b>56</b>	<b>2</b>	<b>12</b>	<b>48</b>	<b>19</b>	<b>638</b>	<b>241</b>	<b>023*</b>	<b>914</b>	<b>0841</b>	<b>14</b>	<b>617</b>
Sum of eight equations	- 3	21	45.5	4 10 6 11	4 10 6 11	4 6 44 26													
Longitude in orbit	4	6	44	25.9	4	22	54	15	1	23	56	7							
Reduction				- 8.9									Arg. I.						
Heliocentric longitude																			
	4	6	44	17															
Heliocentric latitude	-	-	-	-					37	2	9		Secular variation						
													Arg. II.						
													Arg. III.						
													Arg. IV.						
													Arg. V.						
													Arg. VI.						
													Arg. VII.						
													Arg. VIII.						
													Sum of equations						

This is the true heliocentric longitude from the mean equinox ; and if we want it from the true equinox, we must apply the equation of the equinoxes.

In this operation the first five lines are taken out immediately from the tables, and the sums of all the columns give the mean longitude of the aphelion, the node, and the arguments for the given time. Argument I. is immediately found according to the rule, the equation to which is thus found. The equation (Table VI.) for 4 22 is -3 26 59'.6, and the variation or 60' is 4' 31"'.1 ; hence 60' : 54' 15" : : 4 22 : 4' 5".2, which (as the equation is decreasing) subtracted from

-3 26' 59'.6 gives -3 22' 54".5, the equation required. And to find the fecular variation, that variation is + 7'.44 for 4 22, and it decreases 0".16 for 60' ; hence 60' : 54' 15" : : 0".16 : 0".15, which taken from + 7'.44 leaves + 7' 29", the fecular variation corresponding to the given argument. Now this fecular variation is reckoned from 1780, and from thence to November 26, 1789, there has elapsed 9 9 years ; hence, 100 : 99 : : + 7' 29" : + 0".7 the fecular variation for 9 9 years. With argument II, 638, take the equation from Table VII. Now the equation for 630 is 4'.7, and it changes 0".7 for 10 ; hence 10 : 8 : : 0".7 : 0".6, which as the equation



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tion decreases, subtracted from  $4^{\circ}.7$  leaves  $4^{\circ}.1$ , the equation required. By proceeding thus to argument VIII. we get all the equations, and by taking the difference of the positive and negative parts, we get  $3^{\circ} 21' 45''.5$  for the value of the first eight equations; which applied to  $4^{\circ} 10' 6'' 11''.4$  gives  $4^{\circ} 6' 47' 25''.9$  the longitude of the Georgian in his orbit. From this longitude subtract  $2^{\circ} 12' 48' 19''$  the longitude of the node, and we get  $1^{\circ} 23' 56' 7''$ , which is

argument IX.; with which enter Table XVII. and take out the reduction, which is  $- 8''.9$ , and this applied to  $4^{\circ} 6' 44' 25''.9$  gives  $4^{\circ} 6' 44' 17''$ , the heliocentric longitude of the Georgian on the ecliptic from the mean equinox. Also with argument IX. enter Table XVI. and take out the latitude. Now for  $1^{\circ} 23''$  the latitude is  $36' 57''$ , and it increases  $28''.8$  for  $60'$ ; hence  $60' : 56''.7 :: 28''.8 : 26''.9$ , which added to  $36' 57''$  gives  $37' 23''.9$ , the heliocentric latitude of the Georgian.

TABLE I.

Epochs of the mean Longitude of the Planet, with the Arguments of the Equations.

Years.	Mean Longitude of the Georgian.	Aphelion.	Node.	Years.	Arg. II.	Arg. III.	Arg. IV.	Arg. V.	Arg. VI.	Arg. VII.	Arg. VIII.
	S. D. M. S.	S. D. M. S.	S. D. M. S.								
B. 1680	0 17 41 1.4	11 15 35 13	2 12 19 34	B. 1680	215	126	9068	376	8907	057	969
1690	2 0 39 48.2	11 15 44 1	2 12 22 11	1690	435	228	0085	698	9084	781	574
C. 1700	3 13 38 34.9	11 15 52 49	2 12 24 48	C. 1700	656	329	1100	020	9200	505	179
1720	6 9 36 50.9	11 16 10 25	2 12 30 2	B. 1720	096	532	3132	664	9612	953	389
1740	9 5 35 6.8	11 16 28 1	2 12 35 10	B. 1740	537	735	5162	308	9963	401	597
B. 1756	11 14 21 43.5	11 16 42 6	2 12 39 27	B. 1756	890	898	6788	823	0245	560	567
1760	0 1 33 22.7	11 16 45 37	2 12 40 30	B. 1760	978	938	7194	951	0315	849	809
1769	1 10 14 24.2	11 16 53 32	2 12 42 51	1769	177	029	8108	241	0473	501	353
B. 1780	2 27 31 38.6	11 17 3 13	2 12 45 44	B. 1780	419	141	9225	595	0666	297	019
1790	4 10 30 25.3	11 17 12 1	2 12 48 21	1790	640	242	0241	917	0842	021	624
C. 1800	5 23 29 12.1	11 17 20 49	2 12 50 58	1800	860	344	1256	239	1018	745	229
1810	7 6 27 58.7	11 17 29 37	2 12 53 35	1810	080	445	2272	561	1194	468	834
1811	7 10 45 42.9	11 17 30 30	2 12 53 31	1811	103	456	2373	593	1211	541	894
B. 1812	7 15 4 9.5	11 17 31 23	2 12 54 6	B. 1812	125	466	2475	625	1229	614	955
1813	7 19 21 53.7	11 17 32 16	2 12 54 22	1813	347	476	2577	657	1247	686	1015
1814	7 23 39 37.9	11 17 33 9	2 12 54 37	1814	169	486	2678	689	1264	759	1076
1815	7 27 57 22.1	11 17 34 1	2 12 54 53	1815	191	496	2780	721	1272	831	1136
B. 1816	7 32 15 48.7	11 17 34 54	2 12 55 9	B. 1816	213	507	2881	754	1299	904	1197
1817	7 36 33 32.9	11 17 35 47	2 12 55 14	1817	235	517	2983	786	1317	976	1257
1818	7 40 51 17.0	11 17 36 40	2 12 55 40	1818	257	527	3084	718	1334	1048	1318
1819	8 15 9 1.3	11 17 37 33	2 12 55 56	1819	279	537	3186	750	1352	1121	1378
B. 1820	8 19 27 27.6	11 17 38 25	2 12 56 12	B. 1820	301	547	3287	783	1370	1193	1439

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TABLE II.—Mean Motion of the Planet for complete Julian Years.

Years.	Mean Longitude.			Aphelion.			Node.			Years.	Arg.	Arg.	Arg.	Arg.	Arg.	Arg.	Arg.
	S.	D.	M. S.	S.	D.	M. S.	S.	D.	M. S.		II.	III.	IV.	V.	VI.	VII.	VIII.
1	0	4	17 44.2	0	0	0 53	0	0	0 16	1	022	010	0102	032	0018	072	060
2	0	8	35 28.4	0	0	1 46	0	0	0 31	2	044	020	0203	064	0035	145	121
3	0	12	53 12.6	0	0	2 38	0	0	0 47	3	066	030	0305	097	0053	217	181
B. 4	0	17	11 39.2	0	0	3 31	0	0	1 3	B. 4	088	041	0406	129	0070	290	242
5	0	21	29 23.4	0	0	4 24	0	0	1 18	5	110	051	0508	161	0088	362	302
6	0	25	47 7.5	0	0	5 17	0	0	1 34	6	132	061	0609	193	0105	434	363
B. 7	1	0	4 51.8	0	0	6 10	0	0	1 50	B. 7	154	071	0711	225	0123	507	423
8	1	4	23 18.1	0	0	7 2	0	0	2 6	8	176	081	0812	258	0141	579	484
9	1	8	41 2.6	0	0	7 55	0	0	2 21	9	198	091	0914	290	0158	652	544
10	1	12	58 46.8	0	0	8 48	0	0	2 37	10	220	101	1016	322	0176	724	605
11	1	17	16 31.0	0	0	9 41	0	0	2 53	B. 11	243	112	1117	354	0193	796	665
B. 12	1	21	34 57.5	0	0	10 34	0	0	3 8	B. 12	265	122	1219	386	0211	869	726
13	1	25	52 41.7	0	0	11 26	0	0	3 24	13	287	132	1320	418	0229	941	786
14	2	0	10 26.0	0	0	12 19	0	0	3 40	14	309	142	1422	451	0246	014	847
15	2	4	28 10.2	0	0	13 12	0	0	3 55	15	331	152	1523	483	0264	086	907
E. 16	2	8	46 36.7	0	0	14 5	0	0	4 11	B. 16	353	162	1625	515	0281	158	968
17	2	13	4 20.9	0	0	14 58	0	0	4 27	17	375	172	1727	547	0299	231	028
18	2	17	22 5.1	0	0	15 50	0	0	4 43	18	397	183	1828	579	0316	303	089
19	2	21	39 49.3	0	0	16 43	0	0	4 58	19	419	193	1930	612	0334	376	150
B. 20	2	25	58 15.9	0	0	17 36	0	0	5 14	B. 20	441	203	2031	644	0352	448	210
B. 40	5	21	56 31.8	0	0	35 12	0	0	10 28	B. 40	882	406	4062	288	0703	896	420
B. 60	8	17	54 47.7	0	0	52 48	0	0	15 42	B. 60	323	609	6094	931	1055	344	630
B. 80	11	13	53 3.6	0	1	10 24	0	0	20 56	B. 80	764	812	8125	575	1406	792	840
B. 100	2	9	51 19.5	0	1	28 0	0	0	26 10	B. 100	205	015	0156	219	1758	240	050
B. 200	4	19	42 39.1	0	2	56 0	0	0	52 20	B. 200	410	030	0312	438	3516	480	100
B. 300	6	29	33 58.6	0	4	24 0	0	1	18 30	B. 300	615	045	0468	657	5274	720	150
B. 400	9	9	25 18.1	0	5	52 0	0	1	44 40	B. 400	820	060	0624	876	7032	960	200
B. 500	11	19	16 37.7	0	7	20 0	0	2	10 50	B. 500	025	075	0780	095	8790	200	250
B. 600	1	29	7 57.2	0	8	48 0	0	2	37 0	B. 600	230	090	0936	314	0548	440	300
B. 700	4	8	59 16.7	0	10	16 0	0	3	3 10	B. 700	435	105	1092	533	2306	680	350
B. 800	6	18	50 36.3	0	11	44 0	0	3	29 20	B. 800	640	120	1248	752	4064	920	400
B. 900	8	28	41 55.8	0	13	12 0	0	3	55 30	B. 900	845	135	1404	971	5822	160	450
B. 1000	11	8	33 15.4	0	14	40 0	0	4	21 40	B. 1000	050	150	1560	150	7580	400	500

TABLE III.—Mean Motion for Months.

Months.	Mean Longitude.			Aphel.	Node.	Arg.	Arg.	Arg.	Arg.	Arg.	Arg.	
	D.	M.	S.	S.	S.	II.	III.	IV.	V.	VI.	VII.	VIII.
January.	0	0	0.0	0	0	0	0	0	0	0	0	0
February.		21	53.4	4	1	2	1	9	3	1	6	5
March.		41	3.7	9	2	4	2	17	5	3	12	10
April.	1	3	33.1	13	4	6	2	25	8	4	18	15
May.	1	24	44.2	17	5	7	3	33	11	6	24	20
June.	1	46	37.5	22	6	9	4	42	13	7	30	25
July.	2	7	48.6	26	8	11	5	50	16	9	36	30
August.	2	29	42.0	31	9	13	6	59	19	10	42	35
September.	2	51	35.4	35	10	15	7	68	22	12	48	40
October.	3	12	46.4	39	12	17	8	76	24	13	54	45
November.	3	34	39.8	44	13	18	8	85	27	15	60	50
December.	3	55	50.8	48	15	20	9	93	30	16	66	55

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TABLE IV.—Mean motion for Hours and Minutes.

Hours.	Long.	Hours.	Long.	Minutes.	Long.	Minutes.	Long.
	S.		S.		S.		S.
1	1.8	13	22.9	1	0.0	27	0.8
2	3.5	14	24.7	2	0.0	30	0.9
3	5.3	15	26.5	3	0.1	33	1.0
4	7.1	16	28.2	4	0.1	36	1.1
5	8.8	17	30.0	5	0.1	39	1.1
6	10.6	18	31.8	6	0.2	42	1.2
7	12.4	19	33.5	9	0.3	45	1.3
8	14.1	20	35.3	12	0.4	48	1.4
9	15.9	21	37.1	15	0.4	51	1.5
10	17.7	22	38.8	18	0.5	54	1.6
11	19.4	23	40.6	21	0.6	57	1.7
12	21.2	24	42.4	24	0.7	60	1.8

TABLE V.—Mean motion for the Days of the Month.

Days.	Long.			Aphel.	Node.	Arg. II.	Arg. III.	Arg. IV.	Arg. V.	Arg. VI.	Arg. VII.	Arg. VIII.
	D.	M.	S.	S.	S.							
1	0	0	42.4	0	0	0	0	0	0	0	0	0
2	0	1	24.7	0	0	0	0	0	0	0	0	0
3	0	2	7.1	0	0	0	0	1	0	0	1	0
4	0	2	49.5	1	0	0	0	1	0	0	1	1
5	0	3	31.8	1	0	0	0	1	0	0	1	1
6	0	4	14.2	1	0	0	0	2	1	0	1	1
7	0	4	56.6	1	0	0	0	2	1	0	1	1
8	0	5	38.9	1	0	0	0	2	1	0	1	1
9	0	6	21.3	1	0	0	0	2	1	0	2	1
10	0	7	3.7	1	0	0	0	3	1	0	2	2
11	0	7	46.0	2	0	1	0	3	1	1	2	2
12	0	8	28.4	2	1	1	0	3	1	1	2	2
13	0	9	10.8	2	1	1	0	4	1	1	2	2
14	0	9	53.1	2	1	1	0	4	1	1	3	2
15	0	10	35.5	2	1	1	0	4	1	1	3	2
16	0	11	17.9	2	1	1	0	4	1	1	3	3
17	0	12	0.2	2	1	1	0	5	1	1	3	3
18	0	12	42.6	3	1	1	0	5	2	1	3	3
19	0	13	25.0	3	1	1	1	5	2	1	4	3
20	0	14	7.4	3	1	1	1	5	2	1	4	3
21	0	14	49.7	3	1	1	1	6	2	1	4	3
22	0	15	32.1	3	1	1	1	6	2	1	4	4
23	0	16	14.5	3	1	1	1	6	2	1	4	4
24	0	16	56.8	3	1	1	1	6	2	1	5	4
25	0	17	39.2	4	1	2	1	7	2	1	5	4
26	0	18	21.6	4	1	2	1	7	2	1	5	4
27	0	19	3.9	4	1	2	1	7	2	1	5	4
28	0	19	46.3	4	1	2	1	8	2	1	5	5
29	0	20	28.7	4	1	2	1	8	3	1	6	5
30	0	21	11.0	4	1	2	1	8	3	1	6	5
31	0	21	53.4	4	1	2	1	9	3	1	6	5

In the Biflexiles a day must be subtracted for the months of January and February.

# GEORGIUM SIDUS.

TABLE VI.

Equation of the Orbit for 1780, with the secular variation to be applied to the longitude.—Before 1780, this secular variation must be applied with a contrary sign.

ARG. I = (Mean long. — aphelion) or mean anomaly.													
	O'.						P.						
Degr.	Equation.			Difference.		Sec. Var.	Equation.			Difference.		Sec. Var.	Degr.
	—					+	—					+	
	D.	M.	S.	M.	S.	S.	D.	M.	S.	M.	S.	S.	
0	0	0	0.0	5	17.5	0.00	2	32	42.3	4	40.0	4.97	30
1	0	5	17.5	5	17.4	0.17	2	37	22.3	4	37.5	5.13	29
2	0	10	34.9	5	17.4	0.34	2	41	59.8	4	35.0	5.28	28
3	0	15	52.3	5	17.1	0.51	2	46	34.8	4	32.4	5.43	27
4	0	21	9.4	5	16.7	0.68	2	51	7.2	4	28.7	5.58	26
5	0	26	26.1	5	16.3	0.85	2	55	36.9	4	27.0	5.73	25
6	0	31	42.4	5	15.8	1.02	3	0	3.9	4	24.0	5.88	24
7	0	36	58.2	5	15.3	1.19	3	4	27.9	4	21.1	6.02	23
8	0	42	13.5	5	14.6	1.36	3	8	49.0	4	18.1	6.17	22
9	0	47	28.1	5	13.9	1.53	3	13	7.1	4	15.1	6.31	21
10	0	52	42.0	5	13.0	1.70	3	17	22.2	4	11.8	6.46	20
11	0	57	55.0	5	12.2	1.87	3	21	34.0	4	8.7	6.60	19
12	1	3	7.2	5	11.2	2.04	3	25	42.7	4	5.4	6.74	18
13	1	8	18.4	5	10.2	2.21	3	29	48.1	4	2.0	6.87	17
14	1	13	28.6	5	9.0	2.38	3	33	50.1	3	58.7	7.01	16
15	1	18	37.6	5	7.8	2.55	3	37	48.8	3	55.0	7.15	15
16	1	23	45.4	5	6.5	2.71	3	41	43.8	3	51.5	7.28	14
17	1	28	51.9	5	5.1	2.88	3	45	35.3	3	47.9	7.41	13
18	1	33	57.0	5	3.7	3.05	3	49	23.2	3	44.1	7.54	12
19	1	39	0.7	5	2.1	3.21	3	53	7.3	3	40.3	7.67	11
20	1	44	2.8	5	0.5	3.38	3	56	47.6	3	36.5	7.79	10
21	1	49	3.3	4	58.8	3.54	4	0	24.1	3	32.6	7.92	9
22	1	54	2.1	4	57.1	3.70	4	3	56.7	3	28.6	8.04	8
23	1	58	59.2	4	55.2	3.86	4	7	25.3	3	24.6	8.16	7
24	2	3	54.4	4	53.3	4.02	4	10	49.9	3	20.4	8.28	6
25	2	8	47.7	4	51.2	4.18	4	14	10.3	3	16.3	8.40	5
26	2	13	38.9	4	49.1	4.34	4	17	26.6	3	12.0	8.51	4
27	2	18	28.0	4	47.0	4.50	4	20	38.6	3	7.7	8.63	3
28	2	23	15.0	4	44.8	4.66	4	23	45.3	3	3.3	8.74	2
29	2	27	59.8	4	52.5	4.81	4	26	49.6	2	58.9	8.84	1
30	2	32	42.3	4		4.97	4	29	48.5			8.95	0
	+			—			+			—			
	XI'.			—			X'.			—			

# GEORGIUM SIDUS.

TABLE VI.—Continued.

Arg. I = Mean Anomaly.													
Degr.	II:					III:					Degr.		
	Equation.			Difference.	Sec. Var.	Equation.			Difference.	Sec. Var.			
	—				+	—				+			
	D.	M.	S.	M.	S.	S.	D.	M.	S.	M.	S.	S.	
0	4	29	48.5	2	54.4	8.95	5	20	30.6	0	16.3	10.95	30
1	4	32	49.9	2	49.9	9.06	5	20	46.9	0	11.0	10.97	29
2	4	35	32.8	2	45.2	9.16	5	20	57.9	0	4.8	10.99	28
3	4	38	18.0	2	40.6	9.26	5	21	2.7	0	1.0	11.00	27
4	4	40	58.6	2	35.9	9.35	5	21	1.7	0	6.7	11.02	26
5	4	43	34.5	2	31.1	9.45	5	20	55.0	0	12.7	11.02	25
6	4	46	5.6	2	26.2	9.54	5	20	42.3	0	18.7	11.03	24
7	4	48	31.8	2	21.3	9.63	5	20	23.6	0	24.5	11.03	23
8	4	50	53.1	2	16.4	9.72	5	19	59.1	0	30.5	11.03	22
9	4	53	9.5	2	11.5	9.81	5	19	28.6	0	36.6	11.02	21
10	4	55	21.0	2	6.4	9.89	5	18	52.0	0	42.0	11.01	20
11	4	57	27.4	2	1.2	9.97	5	18	10.0	0	48.5	11.00	19
12	4	59	28.6	1	56.2	10.04	5	17	21.5	0	54.3	10.98	18
13	5	1	24.8	1	50.8	10.11	5	16	27.2	1	0.2	10.96	17
14	5	3	15.6	1	45.8	10.19	5	15	27.0	1	6.2	10.94	16
15	5	5	1.4	1	40.4	10.26	5	14	20.8	1	12.2	10.91	15
16	5	6	41.8	1	35.1	10.33	5	13	8.6	1	18.2	10.88	14
17	5	8	16.9	1	29.8	10.39	5	11	50.4	1	24.0	10.85	13
18	5	9	46.7	1	24.2	10.45	5	10	26.4	1	30.0	10.81	12
19	5	11	10.9	1	18.9	10.51	5	8	56.4	1	36.0	10.77	11
20	5	12	29.8	1	13.4	10.56	5	7	20.4	1	41.8	10.73	10
21	5	13	43.2	1	7.8	10.61	5	5	38.6	1	47.8	10.68	9
22	5	14	51.0	1	2.3	10.66	5	3	50.8	1	53.6	10.63	8
23	5	15	53.3	0	56.6	10.71	5	1	57.2	1	59.5	10.57	7
24	5	16	49.9	0	51.1	10.76	4	59	57.7	2	5.3	10.51	6
25	5	17	41.0	0	45.3	10.80	4	57	52.4	2	11.2	10.45	5
26	5	18	26.3	0	39.7	10.83	4	55	41.2	2	16.9	10.38	4
27	5	19	6.0	0	34.0	10.87	4	53	24.3	2	22.7	10.31	3
28	5	19	40.0	0	28.2	10.90	4	51	1.6	2	28.5	10.24	2
29	5	20	8.2	0	22.4	10.93	4	48	33.1	2	34.1	10.16	1
30	5	20	30.6	0		10.95	4	45	59.0	2		10.08	0
			+			—			+			—	
			IX:						VIII:				

# GEORGIUM SIDUS.

TABLE VI.—Continued.

Arg. I = Mean Anomaly.													
	IV.						V.						
Degr.	Equation.			Difference.		Sec. Var.	Equation.			Difference.		Sec. Var.	Degr.
	—					+	—					+	
	D.	M.	S.	M.	S.	S.	D.	M.	S.	M.	S.	S.	
0	4	45	59.6	2	39.8	10.08	2	48	56.7	5	25	6.10	30
1	4	43	19.1	2	45.5	10.00	2	43	54.2	5	6.1	5.92	29
2	4	42	33.0	2	51.4	9.91	2	38	48.1	5	9.5	5.74	28
3	4	37	42.6	2	56.5	9.82	2	33	38.6	5	12.7	5.56	27
4	4	34	46.1	3	2.1	9.72	2	28	25.9	5	15.9	5.37	26
5	4	31	44.0	3	7.6	9.63	2	23	10.0	5	18.9	5.19	25
6	4	28	36.5	3	13.0	9.53	2	17	51.1	5	21.9	4.99	24
7	4	25	23.5	3	18.3	9.42	2	12	29.2	5	24.9	4.80	23
8	4	22	5.2	3	23.6	9.31	2	7	4.3	5	27.5	4.61	22
9	4	18	41.6	3	28.9	9.20	2	2	36.8	5	30.0	4.41	21
10	4	15	12.7	3	34.1	9.08	1	56	6.8	5	32.6	4.21	20
11	4	11	38.6	3	39.1	8.96	1	50	34.2	5	34.9	4.01	19
12	4	7	59.5	3	44.3	8.84	1	44	59.3	5	37.4	3.81	18
13	4	4	15.2	3	49.3	8.72	1	39	21.9	5	39.4	3.61	17
14	4	0	25.9	3	54.3	8.58	1	33	42.5	5	41.5	3.40	16
15	3	56	31.6	3	59.0	8.45	1	28	1.0	5	43.4	3.20	15
16	3	52	32.6	4	4.0	8.32	1	22	17.6	5	45.1	2.99	14
17	3	48	28.6	4	8.6	8.18	1	16	32.5	5	46.8	2.78	13
18	3	44	20.0	4	13.3	8.03	1	10	45.7	5	48.4	2.57	12
19	3	40	6.7	4	17.9	7.89	1	4	57.3	5	49.8	2.36	11
20	3	35	48.8	4	22.4	7.74	0	59	7.5	5	51.1	2.15	10
21	3	31	26.4	4	26.8	7.59	0	53	16.4	5	52.2	1.94	9
22	3	26	59.6	4	31.1	7.44	0	47	24.2	5	53.2	1.73	8
23	3	22	28.5	4	35.4	7.28	0	41	31.0	5	54.3	1.51	7
24	3	17	53.1	4	39.5	7.12	0	35	36.7	5	54.9	1.30	6
25	3	13	13.6	4	43.6	6.96	0	29	41.8	5	55.6	1.08	5
26	3	8	30.0	4	47.6	6.79	0	23	46.2	5	56.1	0.86	4
27	3	3	42.4	4	51.5	6.62	0	17	50.1	5	56.5	0.65	3
28	2	58	50.9	4	55.3	6.45	0	11	53.6	5	56.7	0.43	2
29	2	53	55.6	4	58.9	6.27	0	5	56.9	5	56.9	0.21	1
30	2	48	56.7	4		6.10	0	0	0.0	5		0.00	0
	+ VII.						—	+ VI.				—	



# GEORGIUM SIDUS.

TABLE VII. Equation II.

TABLE VIII. Equation III.

Argument II.					
Arg. II.	Equation II.	Arg. II.	Equation II.	Arg. II.	Equation II.
0	S. 38.4	340	S. 47.7	670	3.3
10	39.0	350	46.5	680	3.4
20	39.6	360	45.2	690	3.5
30	40.1	370	43.9	700	3.8
40	40.7	380	42.5	710	4.2
50	41.3	390	41.0	720	4.8
60	41.9	400	39.4	730	5.5
70	42.5	410	37.8	740	6.3
80	43.2	420	36.1	750	7.2
90	43.9	430	34.4	760	8.3
100	44.7	440	32.7	770	9.4
110	45.4	450	30.8	780	10.7
120	46.2	460	29.0	790	12.1
130	47.0	470	27.1	800	13.5
140	47.8	480	25.2	810	15.0
150	48.5	490	23.4	820	16.6
160	49.2	500	21.6	830	18.1
170	49.9	510	19.8	840	19.7
180	50.5	520	18.1	850	21.3
190	51.1	530	16.3	860	22.9
200	51.7	540	14.8	870	24.5
210	52.1	550	13.3	880	26.0
220	52.4	560	11.7	890	27.5
230	52.7	570	10.4	900	28.9
240	52.8	580	9.2	910	30.1
250	52.8	590	8.0	920	31.4
260	52.7	600	7.0	930	32.6
270	52.4	610	6.1	940	33.6
280	52.1	620	5.3	950	34.6
290	51.6	630	4.7	960	35.4
300	51.0	640	4.0	970	36.3
310	50.3	650	3.5	980	37.0
320	49.5	660	3.4	990	37.7
330	48.6	670	3.3	1000	38.4
340	47.7				

Argument III.					
Arg. III.	Equation III.	Arg. III.	Equation III.	Arg. III.	Equation III.
0	S. 50.0	340	S. 12.7	670	88.7
10	47.3	350	14.3	680	90.0
20	44.5	360	16.0	690	91.1
30	41.7	370	17.8	700	92.0
40	39.0	380	20.8	710	92.8
50	36.4	390	21.8	720	93.4
60	33.7	400	24.0	730	93.8
70	31.2	410	26.3	740	94.1
80	28.7	420	28.7	750	94.2
90	26.3	430	31.2	760	94.1
100	24.0	440	33.7	770	93.8
110	21.7	450	36.4	780	93.4
120	19.8	460	39.0	790	92.8
130	17.8	470	41.7	800	92.0
140	16.0	480	44.5	810	91.1
150	14.3	490	47.3	820	90.0
160	12.7	500	50.0	830	88.7
170	11.3	510	52.7	840	87.3
180	10.0	520	55.5	850	85.7
190	8.9	530	58.3	860	84.0
200	8.0	540	61.0	870	82.2
210	7.2	550	63.6	880	80.2
220	6.6	560	66.3	890	78.2
230	6.2	570	68.8	900	76.0
240	5.9	580	71.3	910	73.7
250	5.8	590	73.7	920	71.3
260	5.9	600	76.0	930	68.8
270	6.2	610	78.2	940	66.3
280	6.6	620	80.2	950	63.6
290	7.2	630	82.2	960	61.0
300	8.0	640	84.0	970	58.3
310	8.9	650	85.7	980	55.5
320	10.0	660	87.3	990	52.7
330	11.3	670	88.7	1000	50.0
340	12.7				

# GEORGIUM SIDUS.

TABLE IX. Equation IV.

Argument IV.				
Arg. IV.	Arg. IV.	Equation IV.		
		M.	S.	Diff.
2500	2500	5	0.0	0.3
2600	2400	4	59.7	0.9
2700	2300	4	58.8	1.5
2800	2200	4	57.3	2.0
2900	2100	4	55.3	2.7
3000	2000	4	52.6	3.2
3100	1900	4	49.4	3.7
3200	1800	4	45.7	4.3
3300	1700	4	41.4	4.8
3400	1600	4	36.6	5.2
3500	1500	4	31.4	5.9
3600	1400	4	25.5	6.2
3700	1300	4	19.3	6.6
3800	1200	4	12.7	7.1
3900	1100	4	5.6	7.4
4000	1000	3	58.2	7.8
4100	900	3	50.4	8.1
4200	800	3	42.3	8.4
4300	700	3	33.9	8.7
4400	600	3	25.2	8.8
4500	500	3	16.4	9.1
4600	400	3	7.3	9.2
4700	300	2	58.1	9.3
4800	200	2	48.8	9.4
4900	100	2	39.4	9.4
5000	0	2	30.0	9.4
5100	9900	2	20.6	9.4
5200	9800	2	11.2	9.4
5300	9700	2	1.9	9.3
5400	9600	1	52.7	9.2
5500	9500	1	43.6	9.1
5600	9400	1	34.8	8.8
5700	9300	1	26.1	8.7
5800	9200	1	17.7	8.4
5900	9100	1	9.6	8.1
6000	9000	1	1.8	7.8
6100	8900	0	54.4	7.4
6200	8800	0	47.3	7.1
6300	8700	0	40.7	6.6
6400	8600	0	34.5	6.2
6500	8500	0	28.6	5.9
6600	8400	0	23.4	5.2
6700	8300	0	18.6	4.8
6800	8200	0	14.3	4.3
6900	8100	0	10.6	3.7
7000	8000	0	7.4	3.2
7100	7900	0	4.7	2.7
7200	7800	0	2.7	2.0
7300	7700	0	1.2	1.5
7400	7600	0	0.3	0.9
7500	7500	0	0.0	0.3

TABLE X. Equation V.

Argument V.			
Arg. V.	Equ. V.	Arg. V.	Equ. V.
0	3.5	510	6.4
10	3.6	520	6.2
20	3.8	530	6.0
30	4.0	540	5.8
40	4.2	550	5.6
50	4.4	560	5.5
60	4.5	570	5.3
70	4.7	580	5.1
80	4.9	590	4.9
90	5.1	600	4.7
100	5.3	610	4.5
110	5.5	620	4.3
120	5.7	630	4.1
130	5.9	640	3.9
140	6.1	650	3.7
150	6.3	660	3.6
160	6.4	670	3.4
170	6.6	680	3.2
180	6.8	690	2.9
190	7.1	700	2.5
200	7.5	710	2.4
210	7.6	720	2.4
220	7.6	730	2.3
230	7.6	740	2.3
240	7.7	750	2.3
250	7.7	760	2.3
260	7.7	770	2.2
270	7.8	780	2.1
280	7.9	790	2.1
290	7.9	800	2.0
300	8.0	810	2.0
310	8.0	820	2.0
320	8.1	830	1.9
330	8.1	840	1.9
340	8.1	850	1.9
350	8.1	860	2.0
360	8.0	870	2.1
370	8.0	880	2.1
380	7.9	890	2.1
390	7.9	900	2.2
400	7.8	910	2.3
410	7.7	920	2.4
420	7.7	930	2.5
430	7.5	940	2.6
440	7.4	950	2.7
450	7.3	960	2.8
460	7.2	970	3.0
470	7.0	980	3.1
480	6.9	990	3.2
490	6.7	1000	3.5
500	6.5		

TABLE XI. Equation VI.

Argument VI.							
Arg. VI.	Equation VI.		Diff.	Arg. VI.	Equation VI.		Diff.
	M.	S.			M.	S.	
0	4	33.1	0.6	5100	0	7.5	0.6
100	4	32.5	1.1	5200	0	8.6	1.1
200	4	31.4	1.7	5300	0	10.3	1.7
300	4	29.7	2.1	5400	0	12.4	2.1
400	4	27.6	2.7	5500	0	15.1	2.7
500	4	24.9	3.1	5600	0	18.2	3.1
600	4	21.8	3.6	5700	0	21.8	3.6
700	4	18.2	4.2	5800	0	26.0	4.2
800	4	14.0	4.5	5900	0	30.5	4.5
900	4	09.5	5.0	6000	0	35.5	5.0
1000	4	04.5	5.4	6100	0	40.9	5.4
1100	3	59.1	5.8	6200	0	46.7	5.8
1200	3	53.3	6.1	6300	0	52.8	6.1
1300	3	47.2	6.5	6400	0	59.3	6.5
1400	3	40.7	6.8	6500	1	6.1	6.8
1500	3	33.9	7.1	6600	1	13.2	7.1
1600	3	26.8	7.4	6700	1	20.6	7.4
1700	3	19.4	7.6	6800	1	28.2	7.6
1800	3	11.8	7.8	6900	1	36.0	7.8
1900	3	4.0	8.0	7000	1	44.0	8.0
2000	2	56.0	8.1	7100	1	52.1	8.1
2100	2	47.9	8.3	7200	2	0.4	8.3
2200	2	39.6	8.3	7300	2	8.7	8.3
2300	2	31.3	8.4	7400	2	17.1	8.4
2400	2	22.9	8.3	7500	2	25.4	8.3
2500	2	14.6	8.4	7600	2	33.8	8.4
2600	2	6.2	8.3	7700	2	42.1	8.3
2700	1	57.9	8.2	7800	2	50.3	8.2
2800	1	49.7	8.1	7900	2	58.4	8.1
2900	1	41.6	7.9	8000	3	6.3	7.9
3000	1	33.7	7.7	8100	3	14.0	7.7
3100	1	26.0	7.6	8200	3	21.6	7.6
3200	1	18.4	7.3	8300	3	28.9	7.3
3300	1	11.1	7.0	8400	3	35.9	7.0
3400	1	4.1	6.7	8500	3	42.6	6.7
3500	0	57.4	6.4	8600	3	49.0	6.4
3600	0	51.0	6.1	8700	3	55.1	6.1
3700	0	44.9	5.7	8800	4	0.8	5.7
3800	0	39.2	5.2	8900	4	6.0	5.2
3900	0	34.0	4.9	9000	4	10.9	4.9
4000	0	29.1	4.4	9100	4	15.3	4.4
4100	0	24.7	4.0	9200	4	19.3	4.0
4200	0	20.7	3.5	9300	4	22.8	3.5
4300	0	17.2	3.0	9400	4	25.8	3.0
4400	0	14.2	2.5	9500	4	28.3	2.5
4500	0	11.7	2.0	9600	4	30.3	2.0
4600	0	9.7	1.5	9700	4	31.8	1.5
4700	0	8.2	1.0	9800	4	32.8	1.0
4800	0	7.2	0.4	9900	4	33.2	0.4
4900	0	6.8	0.1	10000	4	33.1	0.1
5000	0	6.9					

# GEORGIUM SIDUS.

TABLE XII.

Argument VII.								
Arg. VII.	Equation VII.		Arg. VII.	Equation VII.		Arg. VII.	Equation VII.	
	M.	S.		M.	S.		M.	S.
0	I	0.0	340	I	44.5	670	0	13.8
10	I	3.3	350	I	42.7	680	0	12.4
20	I	6.6	360	I	40.7	690	0	11.1
30	I	9.7	370	I	38.5	700	0	10.0
40	I	12.9	380	I	36.1	710	0	9.0
50	I	16.1	390	I	33.6	720	0	8.3
60	I	19.2	400	I	31.0	730	0	7.9
70	I	22.3	410	I	28.3	740	0	7.6
80	I	25.1	420	I	25.5	750	0	7.5
90	I	27.9	430	I	22.5	760	0	7.6
100	I	30.6	440	I	19.4	770	0	7.9
110	I	33.2	450	I	16.3	780	0	8.5
120	I	35.7	460	I	13.2	790	0	9.2
130	I	38.1	470	I	9.9	800	0	10.2
140	I	40.2	480	I	6.6	810	0	11.3
150	I	42.3	490	I	3.3	820	0	12.6
160	I	44.1	500	I	0.0	830	0	14.2
170	I	45.8	510	0	56.7	840	0	15.9
180	I	47.4	520	0	53.4	850	0	17.7
190	I	48.7	530	0	50.1	860	0	19.7
200	I	49.8	540	0	46.8	870	0	21.9
210	I	50.8	550	0	43.7	880	0	24.3
220	I	51.5	560	0	40.6	890	0	26.8
230	I	52.1	570	0	37.5	900	0	29.4
240	I	52.4	580	0	34.5	910	0	32.1
250	I	52.5	590	0	31.7	920	0	34.9
260	I	52.4	600	0	29.0	930	0	37.7
270	I	52.1	610	0	26.4	940	0	40.8
280	I	51.7	620	0	23.9	950	0	43.9
290	I	51.0	630	0	21.5	960	0	47.0
300	I	51.0	640	0	19.4	970	0	50.3
310	I	48.9	650	0	17.3	980	0	53.4
320	I	47.6	660	0	15.5	990	0	56.7
330	I	46.2	670	0	13.8	1000	I	0.0
340	I	44.5						

TABLE XIII.

Argument VIII.				
Arg. VIII.	Arg. VIII.	Eq. VIII.	Arg. VIII.	Eq. VIII.
		S.		S.
250	250	1.3	590	7.0
260	240	1.3	600	7.2
270	230	1.3	610	7.4
280	220	1.4	620	7.5
290	210	1.4	630	7.7
300	200	1.5	640	7.8
310	190	1.6	650	8.0
320	180	1.7	660	8.1
330	170	1.8	670	8.2
340	160	1.9	680	8.3
350	150	2.0	690	8.4
360	140	2.2	700	8.5
370	130	2.3	710	8.6
380	120	2.5	720	8.6
390	110	2.6	730	8.7
400	100	2.8	740	8.7
410	90	3.0	750	8.7
420	80	3.2	760	8.7
430	70	3.4	770	8.7
440	60	3.6	780	8.6
450	50	3.9	790	8.6
460	40	4.1	800	8.5
470	30	4.3	810	8.4
480	20	4.5	820	8.3
490	10	4.8	830	8.2
500	0	5.0	840	8.1
510	990	5.2	850	8.0
520	980	5.5	860	7.8
530	970	5.7	870	7.7
540	960	5.9	880	7.5
550	950	6.1	890	7.4
560	940	6.4	900	7.2
570	930	6.6	910	7.0
580	920	6.8		
590	910	7.0		

# GEORGIUM SIDUS.

TABLE XIV.—Radius Vector for 1780, with the Secular Variation.

Argument I. Mean Anomaly.										
Degrees.	O.			I.			II.			Degrees.
	Rad. Vect.	Diff.	Sec. Var.	Rad. Vect.	Diff.	Sec. Var.	Rad. Vect.	Diff.	Sec. Var.	
			— 0.0			— 00			— 0.0	
0	20.0722	1	005.2	19.9620	73	004.5	19.6547	130	002.9	30
1	20.0721	4	005.2	19.9547	75	004.5	19.6417	131	002.9	29
2	20.0717	6	005.2	19.9472	78	004.5	19.6286	133	002.8	28
3	20.0711	9	005.2	19.9394	80	004.4	19.6153	134	002.7	27
4	20.0702	11	005.2	19.9314	82	004.4	19.6019	135	002.6	26
5	20.0691	14	005.1	19.9232	84	004.3	19.5884	136	002.5	25
6	20.0677	16	005.1	19.9148	86	004.3	19.5748	138	002.5	24
7	20.0661	18	005.1	19.9062	89	004.3	19.5610	140	002.4	23
8	20.0643	21	005.1	19.8973	91	004.2	19.5470	140	002.4	22
9	20.0622	24	005.1	19.8882	92	004.2	19.5330	141	002.3	21
10	20.0598	26	005.0	19.8790	94	004.1	19.5189	142	002.2	20
11	20.0572	29	005.0	19.8696	97	004.1	19.5047	143	002.2	19
12	20.0543	31	005.0	19.8599	98	004.0	19.4904	145	002.1	18
13	20.0512	33	005.0	19.8501	101	004.0	19.4759	146	002.0	17
14	20.0479	36	005.0	19.8400	102	003.9	19.4613	146	001.9	16
15	20.0443	39	005.0	19.8298	105	003.8	19.4467	148	001.8	15
16	20.0404	40	005.0	19.8193	106	003.8	19.4319	148	001.7	14
17	20.0364	43	005.0	19.8087	108	003.8	19.4171	149	001.6	13
18	20.0321	45	005.0	19.7979	110	003.7	19.4022	150	001.5	12
19	20.0276	48	005.0	19.7869	112	003.6	19.3872	150	001.4	11
20	20.0228	50	004.9	19.7757	114	003.5	19.3722	152	001.3	10
21	20.0178	53	004.9	19.7643	115	003.5	19.3570	152	001.3	9
22	20.0125	56	004.8	19.7528	117	003.4	19.3418	152	001.2	8
23	20.0069	57	004.8	19.7411	118	003.3	19.3266	153	001.1	7
24	20.0012	59	004.8	19.7293	121	003.2	19.3113	154	001.0	6
25	19.9953	62	004.7	19.7172	122	003.1	19.2959	155	000.9	5
26	19.9891	64	004.7	19.7050	124	003.1	19.2804	154	000.9	4
27	19.9827	67	004.6	19.6926	125	003.1	19.2650	155	000.8	3
28	19.9760	69	004.6	19.6801	126	003.0	19.2495	155	000.7	2
29	19.9691	71	004.6	19.6675	128	003.0	19.2340	155	000.6	1
30	19.9620		004.5	19.6547		002.9	19.2184	156	000.5	0
	XI.		—	X.		—	IX.		—	

# GEORGIUM SIDUS.

TABLE XIV.—Continued.

Argument I. Mean Anomaly.										
Degrees.	III <sup>a</sup> .			IV <sup>a</sup> .			V.			Degrees.
	Rad. Vect.	Diff.	Sec. Var.	Rad. Vect.	Diff.	Sec. Var.	Rad. Vect.	Diff.	Sec. Var.	
			± 0.0			+			+	
			0.0				0.0			
0	19.2184	156	000.5	18.7613	141	002.2	18.4121	83	004.3	30
1	19.2028	156	000.3	18.7472	140	002.2	18.4038	81	004.3	29
2	19.1872		000.1	18.7332		002.3	18.3957		004.4	28
		156			138			78		
3	19.1716		000.0	18.7194		002.4	18.3879		004.4	27
4	19.1559	157	000.0	18.7057	137	002.5	18.3803	76	004.4	26
5	19.1403	156	000.1	18.6921	136	002.6	18.3729	74	004.5	25
		157			134			70		
6	19.1246		000.2	18.6787		002.6	18.3659		004.5	24
7	19.1090	156	000.2	18.6655	132	002.7	18.3591	68	004.5	23
8	19.0934	156	000.3	18.6524	131	002.8	18.3526	65	004.6	22
		157			130			63		
9	19.0777		000.3	18.6394		002.9	18.3463		004.6	21
10	19.0621	156	000.4	18.6266	128	003.0	18.3403	60	004.7	20
11	19.0466	155	000.5	18.6140	126	003.0	18.3346	57	004.7	19
		156			124			54		
12	19.0310		000.6	18.6016		003.1	18.3292		004.7	18
13	19.0155	155	000.7	18.5893	123	003.2	18.3240	52	004.8	17
14	19.0000	155	000.8	18.5772	121	003.3	18.3192	48	004.8	16
		154			119			45		
15	18.9846		000.9	18.5653		003.4	18.3147		004.9	15
16	18.9691	155	000.9	18.5536	117	003.5	18.3103	44	004.9	14
17	18.9538	153	001.0	18.5421	115	003.5	18.3063	40	004.9	13
		153			113			37		
18	18.9385		001.1	18.5308		003.6	18.3026		004.9	12
19	18.9233	152	001.2	18.5197	111	003.6	18.2992	34	004.9	11
20	18.9082	151	001.3	18.5088	109	003.7	18.2961	31	005.0	10
		152			107			29		
21	18.8930		001.4	18.4981		003.7	18.2932		005.0	9
22	18.8780	150	001.5	18.4877	104	003.8	18.2907	25	005.0	8
23	18.8631	149	001.6	18.4774	103	003.9	18.2884	23	005.0	7
		148			100			19		
24	18.8483		001.7	18.4674		003.9	18.2865		005.0	6
25	18.8335	148	001.7	18.4576	98	004.0	18.2849	16	005.1	5
26	18.8188	147	001.8	18.4480	96	004.0	18.2835	14	005.1	4
		146			93			11		
27	18.8042		001.9	18.4387		004.1	18.2824		005.1	3
28	18.7898	144	002.0	18.4296	91	004.1	18.2817	7	005.1	2
29	18.7755	143	002.1	18.4208	88	004.2	18.2813	4	005.1	1
30	18.7613	142	002.2	18.4122	86	004.3	18.2811	2	005.1	0
	VIII <sup>a</sup> .		0.0 ±	VII <sup>a</sup> .		0.0 +	VI.		0.0 +	

# GEOMETRIC SIDUS

Table 27 - Squares of the Radix Tables

Squaring										
Squaring Table	Radix 10	Radix 100	Radix 1000	Radix 10000	Squaring Table	Squaring Table	Radix 10	Radix 100	Radix 1000	Squaring Table
1	10000	10000	10000	10000	10000	100	100	10000	10000	10000
2	10000	10000	10000	10000	10000	200	200	10000	10000	10000
3	10000	10000	10000	10000	10000	300	300	10000	10000	10000
4	10000	10000	10000	10000	10000	400	400	10000	10000	10000
5	10000	10000	10000	10000	10000	500	500	10000	10000	10000
6	10000	10000	10000	10000	10000	600	600	10000	10000	10000
7	10000	10000	10000	10000	10000	700	700	10000	10000	10000
8	10000	10000	10000	10000	10000	800	800	10000	10000	10000
9	10000	10000	10000	10000	10000	900	900	10000	10000	10000
10	10000	10000	10000	10000	10000	1000	1000	10000	10000	10000
11	10000	10000	10000	10000	10000	1100	1100	10000	10000	10000
12	10000	10000	10000	10000	10000	1200	1200	10000	10000	10000
13	10000	10000	10000	10000	10000	1300	1300	10000	10000	10000
14	10000	10000	10000	10000	10000	1400	1400	10000	10000	10000
15	10000	10000	10000	10000	10000	1500	1500	10000	10000	10000
16	10000	10000	10000	10000	10000	1600	1600	10000	10000	10000
17	10000	10000	10000	10000	10000	1700	1700	10000	10000	10000
18	10000	10000	10000	10000	10000	1800	1800	10000	10000	10000
19	10000	10000	10000	10000	10000	1900	1900	10000	10000	10000
20	10000	10000	10000	10000	10000	2000	2000	10000	10000	10000
21	10000	10000	10000	10000	10000	2100	2100	10000	10000	10000
22	10000	10000	10000	10000	10000	2200	2200	10000	10000	10000
23	10000	10000	10000	10000	10000	2300	2300	10000	10000	10000
24	10000	10000	10000	10000	10000	2400	2400	10000	10000	10000
25	10000	10000	10000	10000	10000	2500	2500	10000	10000	10000
26	10000	10000	10000	10000	10000	2600	2600	10000	10000	10000
27	10000	10000	10000	10000	10000	2700	2700	10000	10000	10000
28	10000	10000	10000	10000	10000	2800	2800	10000	10000	10000
29	10000	10000	10000	10000	10000	2900	2900	10000	10000	10000
30	10000	10000	10000	10000	10000	3000	3000	10000	10000	10000
31	10000	10000	10000	10000	10000	3100	3100	10000	10000	10000
32	10000	10000	10000	10000	10000	3200	3200	10000	10000	10000
33	10000	10000	10000	10000	10000	3300	3300	10000	10000	10000
34	10000	10000	10000	10000	10000	3400	3400	10000	10000	10000
35	10000	10000	10000	10000	10000	3500	3500	10000	10000	10000
36	10000	10000	10000	10000	10000	3600	3600	10000	10000	10000
37	10000	10000	10000	10000	10000	3700	3700	10000	10000	10000
38	10000	10000	10000	10000	10000	3800	3800	10000	10000	10000
39	10000	10000	10000	10000	10000	3900	3900	10000	10000	10000
40	10000	10000	10000	10000	10000	4000	4000	10000	10000	10000
41	10000	10000	10000	10000	10000	4100	4100	10000	10000	10000
42	10000	10000	10000	10000	10000	4200	4200	10000	10000	10000
43	10000	10000	10000	10000	10000	4300	4300	10000	10000	10000
44	10000	10000	10000	10000	10000	4400	4400	10000	10000	10000
45	10000	10000	10000	10000	10000	4500	4500	10000	10000	10000
46	10000	10000	10000	10000	10000	4600	4600	10000	10000	10000
47	10000	10000	10000	10000	10000	4700	4700	10000	10000	10000
48	10000	10000	10000	10000	10000	4800	4800	10000	10000	10000
49	10000	10000	10000	10000	10000	4900	4900	10000	10000	10000
50	10000	10000	10000	10000	10000	5000	5000	10000	10000	10000



# GEORGIUM SIDUS.

TABLE XVI. Heliocentric Latitude for 1750, with the Secular Variation.

Argument IX. Long. of the Planet — long. of Node.

Degrees.	Latitude.		Difference.	Variat. for 10".	Latitude.		Difference.	Variat. for 10".	Latitude.		Difference.	Variat. for 10".	Degrees.
	O. N.				I. N.				II. N.				
	VI. S.				VII. S.				VIII. S.				
	M.	S.			M.	S.			M.	S.			
0	0	0.0	48.4	0.0	23	8.0	41.7	5.0	40	4.1	23.8	8.7	30
1	0	48.4	48.5	0.2	23	49.7	41.4	5.2	40	27.9	23.2	8.7	29
2	1	36.9	48.4	0.3	24	31.1	40.8	5.3	40	51.1	22.3	8.8	28
3	2	25.3	48.4	0.5	25	11.9	40.4	5.4	41	3.4	21.6	8.9	27
4	3	13.7	48.2	0.7	25	52.3	40.0	5.6	41	5.0	20.9	9.0	26
5	4	1.9	48.2	0.9	26	32.3	39.4	5.7	41	55.9	20.1	9.1	25
6	4	50.1	48.2	1.0	27	11.7	38.9	5.9	42	16.0	19.3	9.1	24
7	5	38.3	48.0	1.2	27	50.6	38.5	6.0	42	35.3	18.6	9.2	23
8	6	26.3	47.9	1.4	28	19.1	37.9	6.2	42	53.9	17.7	9.3	22
9	7	14.2	47.8	1.6	29	7.0	37.4	6.3	43	11.6	17.0	9.3	21
10	8	2.0	47.7	1.7	29	44.4	36.8	6.4	43	28.6	16.2	9.4	20
11	8	49.7	47.5	1.9	30	21.2	36.3	6.6	43	44.8	15.3	9.5	19
12	9	37.2	47.3	2.1	30	57.5	35.7	6.7	44	0.1	14.6	9.5	18
13	10	24.5	47.1	2.2	31	33.2	35.2	6.8	44	14.7	13.8	9.6	17
14	11	11.6	46.8	2.4	32	8.4	34.5	6.9	44	28.5	12.9	9.6	16
15	11	58.4	46.7	2.6	32	42.9	34.0	7.1	44	41.4	12.1	9.7	15
16	12	45.1	46.5	2.8	33	16.9	33.3	7.2	44	53.5	11.3	9.7	14
17	13	31.6	46.2	2.9	33	50.2	32.8	7.3	45	4.8	10.8	9.7	13
18	14	17.8	46.0	3.1	34	23.0	32.1	7.4	45	15.3	9.7	9.8	12
19	15	3.8	45.6	3.3	34	55.1	31.4	7.5	45	25.0	8.8	9.8	11
20	15	49.4	45.4	3.4	35	26.5	30.8	7.7	45	33.8	8.0	9.8	10
21	16	34.8	45.1	3.6	35	57.3	30.2	7.8	45	41.8	7.2	9.9	9
22	17	19.9	44.8	3.7	36	27.5	29.5	7.9	45	49.0	6.3	9.9	8
23	18	4.7	44.4	3.9	36	57.0	28.8	8.0	45	55.3	5.5	9.9	7
24	18	49.1	44.1	4.1	37	25.8	28.2	8.1	45	0.8	4.6	9.9	6
25	19	33.2	43.7	4.2	37	54.0	27.4	8.2	46	5.4	3.8	10.0	5
26	20	16.9	43.4	4.4	38	21.4	26.7	8.3	46	9.2	3.0	10.0	4
27	21	0.3	43.0	4.5	38	48.1	26.1	8.4	46	12.2	2.1	10.0	3
28	21	43.3	42.6	4.7	39	14.2	25.3	8.5	46	14.3	1.3	10.0	2
29	22	25.9	42.1	4.8	39	39.5	24.6	8.6	46	15.6	0.4	10.0	1
30	23	8.0		5.0	40	4.1		8.7	46	16.0		10.0	0
	XI. S.				X. S.				IX. S.				
	V. N.				IV. N.				III. N.				

# GEORGIUM SIDUS.

TABLE XV. Equations of the Radius Vector.

Argument.									
Argu- ment.	Equation II.	Equation III.	Equation IV.	Equation VII.	Argu- ment.	Argu- ment.	Equation II.	Equation III.	Argu- ment.
0	0.0070	0.0032	0.0000	0.0098	1000	350	0.0009	0.0005	650
10	0.0070	0.0032	0.0000	0.0098	990	360	0.0007	0.0005	640
20	0.0070	0.0032	0.0000	0.0098	980	370	0.0006	0.0004	630
30	0.0069	0.0032	0.0001	0.0097	970	380	0.0005	0.0003	620
40	0.0069	0.0032	0.0002	0.0096	960	390	0.0004	0.0003	610
50	0.0068	0.0032	0.0003	0.0096	950	400	0.0003	0.0002	600
60	0.0067	0.0031	0.0004	0.0095	940	410	0.0002	0.0002	590
70	0.0066	0.0031	0.0006	0.0093	930	420	0.0001	0.0001	580
80	0.0065	0.0031	0.0007	0.0092	920	430	0.0001	0.0001	570
90	0.0063	0.0030	0.0009	0.0090	910	440	0.0001	0.0001	560
100	0.0061	0.0030	0.0011	0.0089	900	450	0.0000	0.0000	550
110	0.0060	0.0029	0.0014	0.0087	890	460	0.0000	0.0000	540
120	0.0058	0.0029	0.0017	0.0085	880	470	0.0000	0.0000	530
130	0.0056	0.0028	0.0019	0.0082	870	480	0.0000	0.0000	520
140	0.0053	0.0027	0.0022	0.0080	860	490	0.0000	0.0000	510
						500	0.0000	0.0000	500
150	0.0051	0.0027	0.0025	0.0078	850	Argu- ment.	Equation IV.	Equation VII.	Argu- ment.
160	0.0049	0.0026	0.0028	0.0075	840				
170	0.0046	0.0025	0.0032	0.0073	830				
180	0.0044	0.0024	0.0035	0.0070	820				
190	0.0042	0.0023	0.0039	0.0067	810	350	0.0025	0.0020	650
200	0.0039	0.0022	0.0043	0.0064	800	360	0.0022	0.0018	640
210	0.0037	0.0021	0.0046	0.0061	790	370	0.0019	0.0016	630
220	0.0034	0.0020	0.0050	0.0058	780	380	0.0017	0.0013	620
230	0.0030	0.0019	0.0054	0.0054	770	390	0.0014	0.0011	610
240	0.0028	0.0018	0.0058	0.0052	760	400	0.0011	0.0009	600
250	0.0026	0.0016	0.0062	0.0049	750	410	0.0009	0.0008	590
260	0.0024	0.0014	0.0058	0.0046	740	420	0.0007	0.0006	580
270	0.0022	0.0013	0.0054	0.0043	730	430	0.0006	0.0005	570
280	0.0020	0.0012	0.0050	0.0040	720	440	0.0004	0.0004	560
290	0.0018	0.0011	0.0046	0.0037	710	450	0.0003	0.0003	550
300	0.0016	0.0010	0.0043	0.0034	700	460	0.0002	0.0002	540
310	0.0015	0.0009	0.0039	0.0031	690	470	0.0001	0.0001	530
320	0.0013	0.0008	0.0035	0.0028	680	480	0.0000	0.0000	520
330	0.0012	0.0007	0.0032	0.0025	670	490	0.0000	0.0000	510
340	0.0010	0.0006	0.0028	0.0023	660	500	0.0000	0.0000	500

# GEORGIUM SIDUS.

TABLE XVI. Heliocentric Latitude for 1780, with the Secular Variation.

Argument IX. Long. of the Planet — long. of Node.

Degrees.	Latitude.		Difference.	Variat. for 10".	Latitude.		Difference.	Variat. for 10".	Latitude.		Difference.	Variat. for 10".	Degrees.
	O°. N.				I. N.				II°. N.				
	VI°. S.				VII°. S.				VIII°. S.				
	M.	S.			M.	S.			M.	S.			
0	0	0.0	48.4	C.0	23	8.0	41.7	5.0	40	4.1	23.8	8.7	30
1	0	48.4	48.4	0.2	23	49.7	41.4	5.2	40	27.9	23.2	8.7	29
2	1	36.9	48.5	C.3	24	31.1	40.8	5.3	40	51.1	22.3	8.8	28
3	2	25.3	48.4	0.5	25	11.9	40.4	5.4	41	3.4	21.6	8.9	27
4	3	13.7	48.4	0.7	25	52.3	40.0	5.6	41	5.0	20.9	9.0	26
5	4	1.9	48.2	0.9	26	32.3	39.4	5.7	41	55.9	20.1	9.1	25
6	4	50.1	48.2	1.0	27	11.7	38.9	5.9	42	16.0	19.3	9.1	24
7	5	38.3	48.2	1.2	27	50.6	38.5	6.0	42	35.3	18.6	9.2	23
8	6	26.3	48.0	1.4	28	19.1	37.9	6.2	42	53.9	17.7	9.3	22
9	7	14.2	47.9	1.6	29	7.0	37.4	6.3	43	11.6	17.0	9.3	21
10	8	2.0	47.8	1.7	29	44.4	36.8	6.4	43	28.6	16.2	9.4	20
11	8	49.7	47.7	1.9	30	21.2	36.3	6.6	43	44.8	15.3	9.5	19
12	9	37.2	47.5	2.1	30	57.5	35.7	6.7	44	0.1	14.6	9.5	18
13	10	24.5	47.3	2.2	31	33.2	35.2	6.8	44	14.7	13.8	9.6	17
14	11	11.6	47.1	2.4	32	8.4	34.5	6.9	44	28.5	12.9	9.6	16
15	11	58.4	46.8	2.6	32	42.9	34.0	7.1	44	41.4	12.1	9.7	15
16	12	45.1	46.7	2.8	33	16.9	33.3	7.2	44	53.5	11.3	9.7	14
17	13	31.6	46.5	2.9	33	50.2	32.8	7.3	45	4.8	10.8	9.7	13
18	14	17.8	46.2	3.1	34	23.0	32.1	7.4	45	15.3	9.7	9.8	12
19	15	3.8	46.0	3.3	34	55.1	31.4	7.5	45	25.0	8.8	9.8	11
20	15	49.4	45.6	3.4	35	26.5	30.8	7.7	45	33.8	8.0	9.8	10
21	16	34.8	45.4	3.6	35	57.3	30.2	7.8	45	41.8	7.2	9.9	9
22	17	19.9	45.1	3.7	36	27.5	29.5	7.9	45	49.0	6.3	9.9	8
23	18	4.7	44.8	3.9	36	57.0	28.8	8.0	45	55.3	5.5	9.9	7
24	18	49.1	44.4	4.1	37	25.8	28.2	8.1	46	0.8	4.6	9.9	6
25	19	33.2	44.1	4.2	37	54.0	27.4	8.2	46	5.4	3.8	10.0	5
26	20	16.9	43.7	4.4	38	21.4	26.7	8.3	46	9.2	3.0	10.0	4
27	21	0.3	43.4	4.5	38	48.1	26.1	8.4	46	12.2	2.1	10.0	3
28	21	43.3	43.0	4.7	39	14.2	25.3	8.5	46	14.3	1.3	10.0	2
29	22	25.9	42.6	4.8	39	39.5	24.6	8.6	46	15.6	0.4	10.0	1
30	23	8.0	42.1	5.0	40	4.1		8.7	46	16.0		10.0	0
	XI°. S.				X°. S.				IX°. S.				
	V°. N.				IV°. N.				III. N.				

# GEORGIUM SIDUS.

TABLE XVII.

Reduction to the Ecliptic and Logarithm of the Cosine of the heliocentric Latitude.

Arg. IX., or Argument of Latitude.							
Deg.	Reduct. to the Ecliptic.	Log. cofin. of Heliocen. lat.	Reduct. to the Ecliptic.	Log. cofin. of Heliocen. lat.	Reduct. to the Ecliptic.	Log. cofin. of Heliocentric lat.	Deg.
	O'. —		I'. —		II. —		
	VI'. —		VII'. —		VIII. —		
	S.		S.		S.		
0	0.0	10.000000	8.1	9.999990	8.1	9.999971	30
1	0.4	10.000000	8.3	9.999990	8.0	9.999970	29
2	0.7	10.000000	8.4	9.999989	7.8	9.999969	28
3	1.0	10.000000	8.6	9.999988	7.6	9.999969	27
4	1.3	10.000000	8.7	9.999988	7.4	9.999969	26
5	1.6	10.000000	8.8	9.999987	7.2	9.999968	25
6	1.9	9.999999	8.9	9.999986	6.9	9.999967	24
7	2.3	9.999999	9.0	9.999985	6.7	9.999967	23
8	2.6	9.999999	9.1	9.999984	6.5	9.999966	22
9	2.9	9.999999	9.2	9.999984	6.3	9.999966	21
10	3.2	9.999999	9.2	9.999983	6.0	9.999965	20
11	3.5	9.999999	9.3	9.999982	5.8	9.999965	19
12	3.8	9.999998	9.3	9.999982	5.5	9.999965	18
13	4.1	9.999998	9.3	9.999981	5.2	9.999964	17
14	4.4	9.999998	9.3	9.999980	4.9	9.999964	16
15	4.7	9.999998	9.3	9.999980	4.7	9.999963	15
16	4.9	9.999997	9.3	9.999979	4.4	9.999963	14
17	5.2	9.999997	9.3	9.999978	4.1	9.999963	13
18	5.5	9.999997	9.3	9.999978	3.8	9.999962	12
19	5.8	9.999996	9.3	9.999977	3.5	9.999962	11
20	6.0	9.999996	9.2	9.999976	3.2	9.999962	10
21	6.3	9.999995	9.2	9.999976	2.9	9.999962	9
22	6.5	9.999995	9.1	9.999975	2.6	9.999961	8
23	6.7	9.999994	9.0	9.999974	2.3	9.999961	7
24	6.9	9.999993	8.9	9.999974	1.9	9.999961	6
25	7.2	9.999993	8.8	9.999973	1.6	9.999961	5
26	7.4	9.999992	8.7	9.999972	1.3	9.999961	4
27	7.6	9.999992	8.6	9.999972	1.0	9.999961	3
28	7.8	9.999991	8.4	9.999972	0.5	9.999961	2
29	8.0	9.999991	8.3	9.999971	0.4	9.999961	1
30	8.1	9.999990	8.1	9.999971	0.0	9.999961	0
	+ XI'.		+ X'.		+ IX'.		
	+ V'.		+ IV'.		+ III'.		

**GEORGIAN Bible.** See BIBLE.

**GEORGIAN Monks and Nuns,** are religious of Georgia, in Asia, who follow the rule of St. Basil.

**GEORGIANA,** in *Geography*, a name originally given to a tract of country in the province of Maine, in North America.

**GEORGIC,** something that relates to the culture or tilling of the ground.

The word is borrowed from the Latin *georgicus*; and that of the Greek γεωργικός, of γη, terra, earth; and ἔργον, ἔργον, *opero, I work, labour*, of ἔργον, opus, work.

The Georgics of Virgil are four books composed by that poet on the subject of agriculture.

**GEORGIEV,** in *Geography*, a town of Russia, in the government of Caucasus; 32 miles W.N.W. of Ekaterinograd.

**GEORGINA,** in *Botany*, so named by Willdenow in honour of Professor Georgi; see GEORGIA and DANILIA. We have retained the latter name, given by Cavanilles, for this fine genus, because it has been universally adopted in this country, where the various species seem likely to come into general cultivation. A change in such a case not only shocks vulgar prejudices and illiterate indolence, but is materially inconvenient.

**GEORGITZ,** in *Geography*, a town of Walachia; 18 miles N.N.E. of Bucharest.

**GEOSCOPY,** a kind of knowledge of the nature and qualities of the ground or soil, gained by viewing and considering it.

The word is formed of the Greek γη, earth, and σκοπεω, *I see, view*.

Geoscopy is only conjectural; but its conjectures are very well grounded.

**GEOSTATICS.** See STATICS.

**GEPHRUS,** in *Ancient Geography*, a town of Syria, according to Polybius, which surrendered to Antiochus.

**GEPHYRA,** a town of Syria, in the Seleucide territory, according to Ptolemy; 22 miles from Antioch.—Also, a town of Africa, according to Polybius, in the vicinity of Carthage, situated on the bank of the river Macros.

**GEPHYRÆI,** a people mentioned by Herodotus, who were probably natives of Gephyra in Syria; they migrated with Cadmus into Bœotia, where they occupied the territory of Tanagra; but on being driven from thence by the Bœotians, they took refuge in Attica.

**GEPIDÆ,** a people of Scandinavian origin, of whose Gothic extraction Jornandes gives the following account: the Goths, leaving Scandinavia under the conduct of king Barith, put to sea with only three ships. One of these, sailing slower than the other two, was thence called "Gepanta," signifying in the Gothic tongue slow; and hence the name of Gepantæ and Gepidæ, which was at first given them as an appellation of reproach. Procopius likewise expressly affirms, that the Goths, the Vandals, the Visigoths, and the Gepidæ, were originally the same nation; that they had the same customs, manners, religion, and language; and that they only differed in names, borrowed, perhaps, he says, from their different leaders. They entered Scythia with the other Goths, and settled in the neighbourhood of the Tanais and Palus Mæotis. There they continued till the reign of Arcadius and Honorius, when, their number being greatly increased, they approached the Danube, and having afterwards crossed that river, dwelt in the neighbourhood of Singidunum and Sirmium, about the year 400, where they still were when Procopius wrote his history. They had kings of their own, and formed a distinct nation, separate from both the Ostrogoths and Visigoths;

but perhaps not one from the Lombards, who were afterwards masters of Italy. Under their king Fastida, they gained a complete victory over the Burgundians about the year 245; and Fastida, elated with this victory, laid waste the territories of the Goths, whose sovereign Ostrogotha refused to grant them land for their accommodation. Being defeated by the Goths, they afterwards joined them, and other northern nations, in the irruption which they made with their united forces into the empire in the second year of the reign of Claudius; but they were defeated by that prince with great slaughter. In the year 279 Probus granted them lands in Thrace, upon promise of their quiet submission; but whilst the emperor was engaged in war in the East, they seized the neighbouring provinces, and were cut off in great numbers by Probus after his return. St. Jerom mentions the Gepidæ among the other nations of Barbarians, who, in 407, invaded Gaul, and overran its provinces. Attila afterwards subdued them, and in 451 they served under him in his famous expedition into Gaul. Upon the death of Attila, the Gepidæ shook off the yoke under the conduct of their king Ardaric, who obtained a complete victory over the Huns; in consequence of which the Gepidæ not only recovered their ancient liberty, but gained possession of ancient Dacia, N. of the Danube, from which they had been driven by Attila. They then entered into an alliance with the Romans, who agreed to pay them an annual pension. Having obtained possession of part of Illyricum, with the city of Sirmium, they continued quiet till the year 537, when, on account of their joining the Heruli, and plundering the neighbouring provinces, they were compelled by Justinian, after several encounters, to abandon Illyricum, and to content themselves with Dacia beyond the Danube. In the year 550, a quarrel arose between the Gepidæ and the Lombards; but the latter, having obtained a reinforcement from Justinian, attacked the former, and gave them a total overthrow. This defeat was followed by a peace between the two nations, which was brought about by the mediation of Justinian. The peace, however, was of short duration. Under their respective sovereigns, viz. Cunimandus, king of the Gepidæ, and Alboinus, king of the Lombards, they commenced mutual hostilities; and determined to abide by the issue of a single battle. The contest was very severe, and remained for some time very doubtful; but at last, the Gepidæ were put to flight, and pursued by the victorious Lombards with such slaughter, that scarcely one was left alive of the numerous multitude that had engaged. After this victory the Lombards seized the whole of Dacia, and obliged the Gepidæ either to submit, or to retire. Henceforth they had no king of their own, but lived in subjection either to the Lombards, who were masters of their country, or to the princes of the neighbouring nations, especially the Huns, settled in Pannonia. Thus their kingdom terminated in the year 572, Aulin, the successor of Justinian, being then emperor.

**GEPPE,** in *Geography*, a river of Germany, which rises near Neustat in the county of Mark, and runs into the Bigge, two miles N. of Olpe, in Westphalia.

**GER, CARE.** See AGER.

**GERA,** a town of Saxony, in the Vogtland, on the Elster; 30 miles S.S.W. of Leipzig. N. lat. 50° 49'. E. long. 12° 6'.—Also, a town of Italy, in the department of the Upper Po.—Also, a river of Germany, which runs into the Unstrull, six miles N. of Erfurt.

**GERA,** in *Ancient Geography*, a town of Arabia. Ptolemy.

**GERÆA,** a town of Lusitania. Ptolemy.

GERÆSTIUM, a country of the Peloponnesus, in Arcadia.

GERÆSTUS, a town and port of the island of Eubœa, upon the S.W. coast, about 15 miles from Carystus; now Geresto.

GERALFINGEN, in *Geography*, a town of Switzerland; four miles S.E. of Soleure.

GERANDRUM, in *Ancient Geography*, a town of the island of Cyprus.

GERANGER, in *Geography*, a town of Norway, in the diocese of Drontheim; 22 miles S.S.W. of Romfald.

GERANIA, in *Botany*, the 73d natural order in Jussieu's system, or the 13th of his 13th class. The following is his definition of this, one of his most important and extensive classes. Cotyledons two. Petals many. Stamens inserted below the germen.—The Calyx is of one or many leaves, very rarely deficient. Petals hypogynous, or inserted below the pistil, definite in number, very rarely indefinite, for the most part distinct, but sometimes connected at the base, into a sort of false monopetalous corolla; they are rarely wanting. Stamens inserted below the pistil, definite or indefinite, the filaments often distinct, sometimes united all together into one tube, more rarely collected into several bundles; anthers distinct, or united only in *Viola* and *Impatiens* (called *Balsamina* by Jussieu). Germen superior, in many simple, in some multiplied; style single, or multiplied, or deficient; stigma one, or several. Fruit superior, sometimes simple, of one or many cells; sometimes, but more rarely, multiplied, each pericarp of one cell.

The order of *Gerania* is thus defined by Jussieu. *Calyx* simple, either of five leaves, or of one deeply five-cleft, permanent. *Petals* five. *Stamens* definite, their filaments united at the base, sometimes all fertile, sometimes part of them abortive. *Germen* simple; style one; stigmas five, oblong. *Fruit* either of five cells, or of five capsules, each cell or capsule containing one or two seeds. *Coraculum* without a perisperm, (or albumen). *Stem* either somewhat shrubby, or herbaceous. *Leaves* with stipulas, opposite or alternate. *Flowers*, in the former case, opposite to each leaf; in the latter, axillary.

Jussieu enumerates only two genera as properly belonging to this order, *Geranium*, which includes *Erodium* and *Pelargonium* justly separated from that genus by the late M. L'Heritier; see *ERODIUM*: and *Monsonia*, which is but too nearly akin to *Geranium*. He subjoins three genera as related to this order; *Tropæolum*, whose affinity is very obscure; *Impatiens* (his *Balsamina*), which is perhaps still less akin to it; and *Oxalis*, which last we would rather refer to the *Rutaceæ*, an order which Jussieu seems but imperfectly to have studied. He indeed, like Linnæus, hints some relationship between *Oxalis* and *Tribulus* or *Zygophyllum*, both which last he stations in the first section of his *Rutaceæ*; but we presume to think they are there misplaced, and that *Oxalis* is not so much allied to them as to the real *Rutaceæ*, so many of which are found in New Holland. In all such doubtful cases however, which form the difficulty and the pendency of the study of natural orders, and in which our chief guide being conjecture, humility and candour are most becoming, we merely aim at collecting observations. The unnatural combinations complained of in a system professedly artificial, cannot be half so hurtful as error masked in authority in the details of a pretended natural one. The doubts and hints of the excellent Jussieu are in themselves instructive, but how few are content like him to confess their doubts! He has at length acquired a pupil worthy of himself in this country, Mr. R. Brown, whose opportunities of observation, among the paradoxical novelties of

New Holland, have given ample scope to his intelligence and assiduity.

GERANIA, in *Ancient Geography*, a town of Thrace.—Alse, a town of Phrygia.—Alto, an ancient town of the Peloponnesus, in Laconia, on the confines of Messenia.—Alfo, a mountain of Greece, in the territory of Megaris, towards the isthmus of the Peloponnesus.

GERANIS, or GERANIUM, in *Surgery*, a bandage formerly applied to fractured collar-bones, and dislocated shoulders. The word is derived from *γέρανος*, a crane, because the shape of the bandage was thought to resemble an extended crane.

GERANITES, *γέρανος*, a crane, in *Natural History*, a name given by some authors to such pieces of agate, or any other of the semi-pellucid gems, as have round spots in them, resembling in colour the eye of a crane.

GERANIUM, in *Botany*, *γέρανος* of the ancient Greeks, admirably named from *γέρανος*, a crane, the germen and style resembling the head and beak of that bird. Crane's-bill.—Linn. Gen. 350. Schreb. 458. Willd. Sp. Pl. v. 3. 696. L'Herit. in *Art. Hort.* Kew. v. 2. 432. Mart. Mill. Dict. v. 2. Sm. Fl. Brit. 729. Juss. 268. Lamarek Illustr. t. 573. f. 1. Gært. t. 79. pratense. Class and order, *Monadelphica Decandria*. Nat. Ord. *Grinales*, Linn. *Gerania*. Juss.

Gen. Ch. *Cal.* Perianth inferior, of five ovate, acute, concave, permanent leaves. *Cor.* regular, of five large, obovate or obcordate, equal, spreading petals. Nectary five glands at the base of the germen, alternate with the petals. *Stam.* Filaments 10, awl-shaped, recurved, united at the base into a small cup, five alternate ones longest, all shorter than the petals; anthers oblong, versatile, five of them occasionally abortive. *Pist.* Germen superior, with five furrows, beaked; style central, awl-shaped, longer than the stamens, permanent; stigmas five, oblong, reflexed. *Peric.* Capsules five, aggregate, membranous, globose, lateral, separating at their inside, each attached upwards to a long, linear, flat, pointed, rigid, smooth awn, at length elastically recurved, adhering by its point to the summit of the style. *Seeds* foliary, lateral, roundish, their surface smooth or dotted.

Ess. Ch. Calyx of five leaves. Petals five. Nectariferous glands five. Fruit beaked, of five aggregate capsules, each tipped with a long, recurved, naked awn.

Obs. This genus, as above defined, contains only the *Gerania columbina* of Linnæus, or what are commonly called European Geraniums, or Crane's-bills, bearing but one or two flowers on a stalk. (See *ERODIUM*.) Thus it is adopted by Willdenow, who has 39 species, 13 of which are natives of Britain. They are tolerably naturally distributed into three sections.

\* Flower-stalks single-flowered; 4 species.

*G. sanguineum*, Engl. Bot. t. 272, a handsome inhabitant of rocky woods and abrupt gravelly ground, is an example of this section, though the late Mr. Davall once found in Switzerland an occasionally two-flowered variety. See Fl. Brit. 739. A variety found on the Lancashire coast, of humble depressed growth, with white red-veined petals, is frequent in gardens.

*G. silvicum*, Jacq. Hort. Vind. v. 1. t. 19, an inconspicuous species, is, we believe, constantly single-flowered.

\*\* Flower-stalks two-flowered. Root perennial, 24 species. Most of the Crane's-bills usually cultivated for ornament are of this division, as

*G. anemonifolium* of L'Heritier. Curt. Mag. t. 206. This showy species, discovered by Mr. Masson in Madeira, was, as Mr. Curtis records, long known in our gardens by the name *Levigatum*, admirably expressive of its smoothness, and the French botanist changed it for the worse. We could have



no redress, as the original name had not been printed. It is a hardy greenhouse plant, throwing out, from its short knotty stem, a profusion of spreading, long-stalked, thinning, palmate, pinnatifid leaves, and many spreading, leafy branches, forked upwards. The flowers are large, of a fine crimson, broader than a half-crown.

*G. macrorrhizum*, Linn. Sp. Pl. 953. Jacq. Ic. Rar. t. 134, native of Italy, is a very common hardy perennial in our gardens, remarkable for the roundness of its red petals, and the strong, but aromatic, cedar-like, scent of its herbage. The plant is of humble growth, with a short knotty stem, like the last. Leaves soft and downy.

*G. phœum*, Linn. Sp. Pl. 953. Engl. Bot. t. 322; and

*G. fuscum*, Linn. Mant. 97, two species very nearly akin, are remarkable for the dark brown colour of their flowers; as *G. reflexum*, *ibid.* 257. Cavan Diss. t. 81. f. 1, is for its reflexed petals, and *G. lividum*, L'Herit. Geran. t. 39, first well determined by Haller at his No. 935, though he was not for some time attended to, for its flat, round, serrated petals, of a pale livid dove-colour. These four last are often seen in gardens about London.

*G. nodosum*, Linn. Sp. Pl. 953. Engl. Bot. t. 1091, is the most rare British species, and scarcely found elsewhere but on the mountains of Provence and Dauphiny, in shady places.

*G. striatum*, Linn. Sp. Pl. 953. Curt. Mag. t. 55, a native of Italy, very hardy with us, is generally admired for its delicately pencilled blossoms.

*G. angulatum*, Curt. Mag. t. 203, now frequent in gardens about London, but from what country imported is not known, was first ascertained as a distinct species by the late Mr. Curtis. Its flowers are prettily veined with reddish purple on a pale ground.

*G. pratense*, Linn. Sp. Pl. 954. Engl. Bot. t. 404, a very handsome blue-flowered species, common in pastures in the north, is extremely remarkable, and almost singular in this natural order, for having sometimes double flowers, in which state it was found near Athol house, Scotland, by lady Charlotte Murray in 1793. It is often seen with white petals.

*G. argenteum*, Linn. Sp. Pl. 954. Curt. Mag. t. 504, a native of Mount Baldus, was introduced into England by the indefatigable and intelligent Mr. Lodge, whose zeal and liberality as a cultivator are above all praise. Its leaves are beautifully silvery, the plant dwarf, but the flowers peculiarly large, bluish-coloured, veined with red.

*G. pyrenaicum*, Linn. Mant. 97. Sm. Fl. Brit. 735. Engl. Bot. t. 405. Curt. Lond. fasc. 3. t. 42, common about London and Edinburgh, has not been well understood, even by Mr. Curtis, who undertook to illustrate it. Linnæus originally confounded it with *molle* hereafter mentioned, from which its even capsules, perennial root, and greater magnitude, keep it very distinct.

\*\*\* Flower-stalks two-flowered. Root annual; 11 species.

*G. lobenicum*, Linn. Sp. Pl. 955, placed first in this section, well drawn in Dillenius's Hort. Elth. t. 133. f. 160, is remarkable for its very black hairy seed-vessels, and vitæd herbage.

*G. molle*, Engl. Bot. t. 778, ought to follow immediately; with *dissectum*, t. 753; *rotundifolium*, t. 157; and *puffillum*, t. 385. These four, long confounded, and scarcely understood by any botanist, are beautifully distinguished, in every degree of luxuriance, by their capsules, which are corrugated and naked in the first; more slightly corrugated, but hairy, with reticulated seeds, in the second; carinated, even and hairy, with reticulated seeds in the third, with much more entire leaves; even and hairy, with smooth seeds, in the last, whose hairs on the part in question are, moreover, close-pressed, not spreading

as in the preceding. We were obliged to the late Mr. Davall for first calling our attention to this part, and thus leading to one of the most satisfactory discoveries in European botany.

*G. carolinianum*, Linn. Sp. Pl. 956. Jacq. Hort. Schonbr. v. 2. t. 140, where it is mistaken for a new plant, and called *lanuginosum*! follows these; with *columbinum*, Engl. Bot. t. 259. To which should succeed *lucidum*, t. 75; then, if it be a distinct species, which we much doubt, *purpureum* of Willdenow, n. 39, and Villars Dauph. t. 40; and finally *robertianum*, Engl. Bot. t. 1486. Curt. Lond. fasc. 1. t. 52. This *purpureum* has been a weed in Chelsea garden ever since the time of Miller, but though Ray mentions it as a native, see Fl. Brit. 732, *G. robertianum* β, we never gathered it elsewhere.

GERANIUM, in Gardening, comprehends plants of the herbaceous perennial kind, of which the species cultivated are, the dark flowered crane's-bill (*G. phœum*); the knotty crane's-bill (*G. nodosum*); the streaked crane's-bill (*G. striatum*); the Siberian crane's-bill (*G. sibiricum*); the bloody crane's-bill (*G. sanguineum*); and the long-rooted crane's-bill (*G. macrorrhizum*); but there are other sorts that may be cultivated with propriety.

The fifth species has several varieties, as with short spreading stems and small leaves and flowers; with large leaves deeply divided, and with variegated or striped flowers.

*Method of Culture*.—Each of these species of plants is capable of being increased in two ways, either by sowing the seeds or parting the roots. Where the first method is adopted, the seeds should be sown in the autumn as soon as they have become perfectly ripened, either in pots or a shady border in the garden ground where the mould is light and fine. As soon as the plants have acquired a few inches in growth, they should be pricked out into other pots, or beds of similar earth, at the distance of five or six inches in the latter case; but where this cannot be done, they may be permitted to remain until the following autumn or spring, and be then put out into other pots or borders, where they are to continue, being occasionally watered in a moderate manner.

In cases where the parting of the roots is practised, care should be taken not to divide them too much; planting them out in the early part of the autumn, either in pots or where they are to continue.

Most of these sorts of plants are of rather hardy growth, and succeed in most kinds of ground, demanding but little attention in their cultivation, beside that of their being kept clear from all sorts of weeds and rubbish.

All of them are capable of affording variety in the borders, clumps, and other parts of pleasure gardens, and the potted kinds produce a fine effect in situations about the houses in mixture with those of other sorts.

GERANOS, Γερανός, in Antiquity, a remarkable dance performed in the festival called *Delia*.

GERANZAGO, in Geography, a town of Italy; nine miles E.N.E. of Pavia.

GERAR, or GERASAR, or *G. zarab*, in Scripture Geography, a city of the Philistines, S. of Judah. The Abimelechs were kings of this city in the time of Abraham and Isaac. At this time it was the boundary of the Canaanites, situated on the river Bezor, about seven miles S.W. of Debir, and six E. of Beertheba. It afterwards belonged to the tribe of Simeon. Gerar extended far into Arabia Petraea, being 25 miles from Lacedaemopolis, beyond Daroma, the south of Gudah. Moses says, that it lay between Kadash and Shur; and he mentions the brook or valley of Gerar. (Gen. xxvi. 26.) Sozonen speaks of a little town, called *Gerar*, 50 furlongs from Pelatium.

Gerar is confounded with Beersheba, Ashkelon, Allufh, and Arad.

GERARD, HERB, in *Botany*. See *ÆGOPIDIUM*.

GERARD, in *Biography*, who flourished about the end of the eleventh, and commencement of the twelfth centuries, founder and first grand-master of the order of St. John of Jerusalem, was a native of the isle of Martigues, on the coast of Provence. While Jerusalem was in the hands of the Saracens, some Neapolitan merchants obtained permission from the sultan of Egypt and Syria, in the year 1050, to erect a Benedictine monastery, near the holy sepulchre, for the convenience of the pilgrims who came to visit it. Among others Gerard came to pay his devotions at the holy city, where he obtained a high character for piety and prudence. The monastery soon became rich, and in conformity with the spirit of the times the abbot built, with the wealth poured in by the rich devotees, an hospital for the reception of the poorer class, and with proper accommodation for the aged and the sick. The management of this he gave to Gerard. A part of the building was separated for a chapel dedicated to St. John, because it was said that Zacharias, the father of St. John, had lived on the spot where it was built. Gerard, after the conquest of Jerusalem, by Godfrey of Bouillon, projected the foundation of a new religious order, in which the ecclesiastical and military character should be blended. He began, about the year 1100, to carry his design into execution, when numbers of persons associated with him under the denomination of the "Hospitalers of St. John of Jerusalem," who, besides the three usual vows of chastity, poverty, and obedience, took a particular vow to devote themselves to the relief of all Christians in distress. The order was recognized, and privileges granted to it by pope Paschal II. Gerard was the first grand-master, and such was the commencement of that order which has been so frequently and so long celebrated in history: the members of it were first denominated knights of Rhodes, and afterwards knights of Malta. Moreri.

GERARD, JOHN, a learned German Lutheran divine, was born at Jena in the year 1621, where he was educated, but at the age of nineteen he went to Altdorf for the sake of greater progress in the oriental languages, and in 1643 the university conferred on him the degree of M.A. He was appointed professor of philosophy at Wittenberg in 1646, and in 1652 he was nominated professor of history at Jena. After this he was created doctor of divinity, and made professor in that faculty, having devoted much of his time to biblical and theological learning. He was likewise appointed rector of the university of Jena. He died in the year 1688, and left behind him, as memorials of his great learning, many works of very deep erudition: among these were "Harmonia Linguarum Orientalium;" "Disputatorium theologicarum Fasciculus;" "De Ecclesie Copticae Ortu, Progressu, et Doctrina."

GERARD, ALEXANDER, was born at Garioch, in the county of Aberdeen, in the year 1728: he was educated at the grammar-school at Aberdeen, and so great was his progress, that he was entered a student in Marischal college when he was but twelve years of age. Here he devoted his first four years to the study of Greek, Latin, the mathematics, and philosophy, and was, at the close of the course, admitted to the degree of M.A. He now commenced his theological studies, which he prosecuted at the universities of Aberdeen and Edinburgh. Immediately on the completion of his twentieth year, he was licensed to preach in the church of Scotland, and in the year 1750 was chosen assistant to Mr. David Fordyce, professor of philoso-

phy in the Marischal college at Aberdeen, and in two years afterwards, upon the death of the professor, Gerard was appointed to succeed him. Here, after a short time, the department assigned to Mr. Gerard was confined to moral philosophy and logic, the duties of which he discharged with conscientious and unwearied diligence, and with equal success and reputation. He was a member of a literary society at Aberdeen, which met very regularly every fortnight during the winter, when the members communicated their sentiments with the utmost freedom, and received mutual improvement from their literary discussions. In 1759 Mr. Gerard was ordained a minister of the church of Scotland, and in the following year he was appointed professor of divinity in the Marischal college, and about the same period he took his degree of doctor of divinity. He continued to perform the several duties attached to his offices till 1771, when he resigned the professorship, together with the church living, and was preferred to the theological chair in the university of King's college, a situation which he held till his death in 1795. Dr. Gerard's attainments were solid rather than brilliant, the effect of close and almost incessant study, and a fine judgment. He had improved his memory to such a degree, that he could, in little more than an hour, get by heart a sermon of ordinary length. He was author of "An Essay on Taste," which was published in 1759, and which obtained for him the prize of a gold medal, from the Society of Edinburgh. This work was afterwards much enlarged and reprinted in 1780. His "Dissertations on the Genius and evidences of Christianity," published in 1766, are well known and highly appreciated: so also are his "Essay on Genius," and his sermons in two volumes. In the year 1799 his sons gave the world a posthumous work of much merit, which had been left among the papers of his father, entitled "The Pastor's Care," which made a part of his theological course of lectures. As a clergyman the conduct of Dr. Gerard was marked with prudence, exemplary manners, and the most punctual and diligent discharge of his ministerial duties: his sermons were simple and plain, adapted to the common class of hearers, but so accurate as to secure the approbation of the ablest judges. As a professor of divinity, his great aim was not to impose by his authority upon his pupils any favourite system of opinions; but to impress them with a sense of the importance of the ministerial office; to teach them the proper manner of discharging all its duties; and to enable them, by the knowledge of the scriptures, to form a just and impartial judgment on controverted subjects. Possessing large stores of theological knowledge, he was judicious in selecting his subjects, happy and successful in his manner of communicating instruction. He had the merit of introducing a new, and in many respects a better, plan of theological education, than those on which it had formerly been conducted. Having a constant regard to whatever was practically useful, rather than to unedifying speculations, he enjoined no duty which he was unwilling to exemplify in his own conduct. In domestic life he was amiable and exemplary: in his friendships steady and disinterested, and in his intercourse with society hospitable, benevolent, and unassuming; uniting to the decorum of the Christian pastor, the good breeding of a gentleman, and the cheerfulness, affability, and ease of an agreeable companion.

GERARDE, JOHN, a surgeon and famous herbalist of the time of queen Elizabeth, was born at Namptwich, Cheshire, in 1545. He practised surgery in London, and rose to eminence in that profession. Mr. Granger says "he was many years retained as chief gardener to lord Burleigh, who was himself a great lover of plants, and had the best col-

lection of any nobleman in the kingdom: among these were many exotics, introduced by Gerarde." This is confirmed by the dedication of the first edition of his Herbal, in 1597, to that illustrious nobleman, in which he says he had "that way employed his principal study, and almost all his time" then for 20 years. It appears therefore that he had given up his original profession. Johnson, the editor of his second edition, says "he lived some ten years after the publishing of this work, and died about 1607;" so that he survived his noble patron nine years. See CECIL, WILLIAM.

Gerarde lived in Holborn, and had there a large botanic garden of his own, of which he published a catalogue in 1596 and again in 1599. Of this work scarcely an impression is known to exist, except one in the British Museum, which proved of great use in preparing the *Hortus Kewensis* of Mr. Aiton, as serving to ascertain the time when many old plants were first cultivated. Holborn was then in the outskirts of the town on that side. The reader of English history will recollect that the hypocritical Richard III. asked the bishop of Ely to send for "some of the good strawberries which he heard the bishop had in his garden in Holbourn," by way of shewing himself in good humour at the council, while he was in fact meditating the seizure of lord Hallings. The catalogue of Gerarde's garden contains, according to Dr. Pulteney, 1033 species, or at least supposed such, though many doubtless were varieties, and there is an attestation of Lobel subjoined, asserting his having seen nearly all of them growing and flowering. This was one of the earliest botanic gardens in Europe.

The great work of our author is his Herbal, or General History of Plants, printed in folio in 1597, by John Norton, who procured the wooden cuts from Frankfort, originally done for the German herbal of Tabernæmontanus. The basis of the text was the work of Dodonæus entitled *Pemptades*, for which also we believe the same cuts had been used; see DODONÆUS. Lobel asserts that a translation of the Pemptades had been made by a Dr. Priest, at the expense of Mr. Norton, but the translator dying soon after, the manuscript was used by Gerarde, indeed without acknowledgment. The intelligent reader of the Herbal will observe that most of the remarks relative to the places in which certain plants are found, their common uses, &c., belong to the original work, and refer to the country in which Dodonæus wrote, not to England. Gerarde is also accused of having been no Latin scholar, and of having made many mistakes in the additional matter which he translated from the works of Clusius, Lobel, &c. He also certainly misapplied many of the cuts. Notwithstanding such faults, Gerarde had the great merit of a practical knowledge of plants, with unbounded zeal, and indefatigable perseverance. Dr. Pulteney justly observes that notwithstanding his manifest inferiority to Lobel in point of learning, it must yet be owned that Gerarde contributed greatly to bring forward the knowledge of plants in England. His connection with the great, and his situation in London, favoured an extensive correspondence, both with foreigners and his own countrymen; and his success in procuring new exotics, as well as scarce indigenous plants, was equal to his diligence and assiduity. In fact, we owe to Gerarde and his friends the discovery of many new English plants; and his name will be remembered by botanists with esteem, when the utility of his Herbal is superadded." Among the persons to whom he was indebted for the communication of exotic plants and seeds, are recorded sir Walter Raleigh, Edward lord Zouch, and lord Hunston, with many of less elevated rank.

A second edition of Gerarde's Herbal was published by

Dr. Thomas Johnson in 1636, which has ever since been a very popular book, and indeed, as Haller remarks, Gerarde was the classical author of the English, almost to the time of Ray. Johnson, like many other editors, censured his author with great freedom, and undoubtedly made many essential corrections. He has prefixed a list of his additions, which are very numerous, and a learned historical preface. He was a man of far more learning than Gerarde, but by no means so good a botanist. Among the most valuable of his additions are the communications of Mr. John Goodyer of Maple-Durham, Hampshire, a man of singular penetration and accuracy in practical botany. Johnson added many excellent figures, either of new plants, or in the place of such as were badly executed in the first edition. Among the latter is *Gratiola laifolia*, which Haller complains he could make nothing of. It proves to be *Scutellaria minor*, and is well represented in Johnson's edition, p. 581.

Mr. Granger, in his Biographical History of England, ed. 4. v. 1. 275, mentions only two engraved portraits of Gerarde.

"JOHN GERARDE; engraved by William Rogers, for the first edition of his Herbal.

Ditto engraved by Paine, for Johnson's edition of the same book."

The latter, dated 1636, is a small copy of the former. There is a sprig of the potatoe plant in the left hand.

The writer of the present article is possessed of the copper-plate itself, very much worn, of an octavo portrait of Gerarde, without age or date, holding a sprig of *Cistus*, with his arms and the Italian motto, *D'affetti, bene*. In one corner below is a branch of Jasmine, in the other the Bugloss. The name of the engraver seems to be Hall. Pulteney's Sketches of the Progress of Botany in England. Granger's Biographical History of England. Haller's Bibl. Bot. S.

GERARDIA, in *Botany*, named by Plumier in memory of the English herbalist John Gerarde; see that article. (It may also serve to commemorate a botanist of our own time, Louis Gerard, M. D. author of the excellent *Flora Galloprovincialis*, published in 1761, with a few exquisitely engraved plates, and who, we believe, is still living, at a very advanced age, at Cottignac in Provence, where the writer of this visited him in 1786. (See *Tour on the Continent*, ed. 2. v. 1. 204.)—Plum. *Nov. Gen.* 30. t. 12. Linn. *Gen.* 307. Schreb. 403. Willd. *Sp. Pl.* v. 3. 221. Mart. *Müll. Dict.* v. 2. Juss. 119. Lamarek. *Illustr.* t. 529. (Nigella; Linn. *Mant.* 42 and 512. Melasma; Berg. *Cap.* 162. *Gærtn.* t. 55.)—Class and order, *Didymnania Angiospermi*. Nat. Ord. *Personata*, Linn. *Scrophularia*, Juss.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, permanent, with five upright, sharp segments. *Cor.* of one petal, ringent, tube round, longer than the calyx; upper lip erect, obtuse, flat, broadest, emarginate; lower reflexed, deeply three-cleft, its lateral segments emarginate, the middle one shorter, deeply divided. *Stam.* Filaments four, scarcely so long as the tube, two of them rather shorter than the rest; anthers small. *Pist.* Germen superior, ovate, small; style simple, short; stigma obtuse. *Peric.* Capsule ovate, of two cells and two valves, opening at the base, the partition contrary to the valves. *Seeds* ovate; according to Linæus solitary, which does not appear from Plumier's works.

Ess. Ch. Calyx five-cleft. Corolla two-lipped; the lower lip in three deep emarginate lobes, the middlemost deeply divided. Capsule of two cells, opening at the base.

This

pany with six other persons, members of the same society. On his arrival he remained at Pekin, studying the language, and during this period, being admitted frequently into the presence of the emperor, he so ingratiated himself with him, as to obtain an appointment to join an embassy sent to regulate the boundaries with the court of Muscovy. He contributed much to the success of this business, and on his return to China was treated with great honour by the emperor, who chose him his instructor in mathematics and philosophy. Gerbillon is supposed to have enjoyed more advantages than almost any other person, for studying the manners of the Chinese court, and for making observations on the neighbouring country. He obtained permission to preach the Christian religion in China, and had the direction of the French college in Pekin, and was in the end made superior-general of all the missionaries sent from France. He died at Pekin in the year 1707, leaving behind him curious accounts of his eight journeys into Tartary, which have been printed in Du Halde's Description de la Chine. He was the author of the "Elements of Geometry," and of a work on Perspective, both printed in a very handsome manner at Pekin. Moreri.

GERBOA, in *Zoology*. See DIRUS.

GERBSTADT, in *Geography*, a town of Germany, in the county of Mansfeld; 30 miles S.W. of Dessau. N. lat.  $51^{\circ} 40'$ . E. long.  $11^{\circ} 47'$ .

GERDAU, a river of Luneberg, which runs into the Umenau, at Oldentadt.

GERDAVEN, a town of Prussia, in the province of Natangen, situated on the Omet, near a considerable lake, which is called the "Calendar of Gerdaven," from its prognosticating the weather; 30 miles S.E. of Konigsberg. N. lat.  $54^{\circ} 16'$ . E. long.  $21^{\circ} 27'$ .

GERDEN, a town of Germany, in the bishopric of Paderborn; 14 miles E. of Paderborn.

GERDES, DANIEL, in *Biography*, was born at Bremen in 1698, where his father was engaged in a commercial life. Great care was taken of the education of Daniel, who made a rapid progress in the classics. At first it was intended he should pursue the law as a profession, but the plan was changed, and he devoted himself to the study of theology. In 1722 he was admitted into holy orders, and immediately afterwards made a tour on the continent, and formed an acquaintance with the most learned men of that period. In 1726 he was admitted to the degree of doctor, and in 1735 he was chosen professor of theology at Groningen, and upon his entrance on the office he delivered an oration "De unctione quæ Fideles omnia docet." The same year he was elected a member of the royal academy of sciences at Berlin. He died in the year 1765, leaving behind him many works that bear ample testimony to his learning and zeal in the cause of literature. His writings are mostly theological, and tend to the elucidation of the difficult parts of the Old and New Testament. Gen. Biog.

GERDIN, in *Geography*, a town of Russia, in the government of Perm, situated on the Colva; 152 miles N. of Perm. N. lat.  $59^{\circ} 40'$ . E. long.  $56^{\circ} 14'$ .

GERDOBA, a mountain of Africa; 80 miles E. of Angela.

GEREEK, a town of Hindoostan, in Bahar; 12 miles S. of Bahar.

GEREM, a town of Grand Bucharia; 15 miles S.S.W. of Balakhan.

GEREMSIANGKALA, a town of Russia, in the government of Upha; 36 miles W.N.W. of Bugulna.

GEREN, a town of Prussia, in Pomerelia, on the Vistula; 9 miles W.S.W. of Marienburg.

GERENIA, or GERUNIUM, in *Ancient Geography*, a town of Italy.—Also, a town of the Peloponnesus, in Laconia. Ptolemy.—Also, a town of Messenia, on an eminence, S.W. of Alagonia. Pausanias says that this town was the same with the "Enope" of Homer. It was consecrated to Machaon, an ingenious physician, slain by Eryphilus, whose bones were collected by Nestor, and deposited at Rhodon, near this town. It had a temple dedicated to Machaon. East of it was a mountain called "Calathéon," on which was a temple consecrated to Calathea, with a grotto, having a strait entrance, and containing in its interior many curiosities.

GERENNA, or JERENNA, in *Geography*, a town of Spain, in the province of Seville, surrounded by large stones, supposed to have been the effect of an earthquake; 12 miles N.N.W. of Seville.

GERENSCHANSKOI, a fortress of Russian Siberia, in the government of Kolivan; 240 miles S.S.W. of Kolivan. N. lat.  $50^{\circ} 45'$ . E. long.  $79^{\circ} 14'$ .

GERESHEIM, a town of the duchy of Berg; 5 miles E. of Duffeldorf.

GERE SOL, in *Music*, one of the clefs.

GERESPA, in *Ancient Geography*, a town of Asia, in the interior of Media, sometimes called *Gerepa*, and *Gerefa*.

GERESTADT, in *Geography*, a town of Norway, in the bishopric of Aggerhuus; 32 miles S.W. of Tonsberg.

GERESTO, a town of the island of Negropont; 15 miles S. of Carilo.

GEREUTH, a town of the principality of Wurzburg; 5 miles N. of Ebern.

GERFALCON, GYRFALCON, or *Jersfalcon*, (see FALCON). This is naturally a very bold, wild and fierce bird, and is therefore very difficult to be reclaimed; but when that is done it proves one of the very best kinds, and will fly at almost any thing. The beak of the gersfalcon is always blue, and the claws are remarkably long and strong.

In going up to the gate, as the sportsmen express it, these birds do not hold the same sort of course that others do, but immediately climb up upon the train on sight of the bird, and as soon as they have reached her, they immediately make the attack, and generally pull her down at the first encounter; but if not, always at the second or third.

This sort of hawk is to be fed and rewarded like the others. It is of a very sly and crafty nature, and is so slothful, that it loves to keep the casting a long time; therefore, instead of cotton, it is proper to give them sometimes a casting of tow, and to keep them sharp ft. As to the reclaiming this sort of hawk, it is only to be done by gentleness and kindness; and when she has been taught to be turned loose, she is not to be taught to come to the pelts of hens or other fowl. But she must never be suffered to taste any living flesh, for that will be apt to draw away her love from the hand and voice. Whenever she eats, the falconer must be close to her, and must make her eat the choicest pieces out of his hand. There is great care to be taken in the making of these birds, for as they are made at first, so they are for ever; and it is a necessary caution, with birds of this bold and fierce nature, not to hurry over the business, but to repeat the same thing very often till it is perfectly fixed. See FALCONRY.

GERGAR, in *Geography*, a town of Spain, in the province of Grenada; 10 miles S.W. of Purchena.

GERGEFALVA, a town of Transilvania; 16 miles W. N.W. of Hermenstadt.

GERGESA. See GERASA.

**GERGESENES**, or **GIRGASHITES**, in *Ancient Geography*, an ancient people, who inhabited the land of Canaan, before the Israelites took possession of it. Their territory lay next above that of the Amorites, on the east side of the sea of Tiberias; and it was afterwards possessed by the half-tribe of Manasseh. See **GERESA**.

**GERGETHA**, or **GERGITHA**, a town situated in the Troade, E. of Rhetium, Ophrynum, and Dardanus, in the vicinity of the site of Troy or Ilium, near mount Ida. This town appears to have been inland at some distance from the sea.

**GERGINA**, a town of Asia, in Phrygia, at the foot of mount Ida, seeming to be the same with Gergetha.

**GERGIS**, the name given by Steph. Byz. to the *Gergetha* of Strabo.

**GERGIS**, in *Geography*, a town of Africa; 80 miles W. of Tripoli.

**GERGOVIA**, in *Ancient Geography*, a strongly fortified place of Gaul, belonging to the Arverni. According to Cæsar (l. vii. 36.) it was situated on a very high mountain, and every access to it was extremely difficult. At length it was obliged to submit to the victorious arms of Rome, and it was probably so completely destroyed, that no trace remains from which we may ascertain its situation. It has been conjectured, however, that its situation was in the vicinity of Clermont.

**GERHARDSBRON**, in *Geography*, a town of Germany, in the principality of Anspach; 28 miles W. of Anspach. N. lat. 49°. 17'. E. long. 10°.—Also, a town of Wurtemberg; 28 miles E. of Hailbron.

**GERINES**, a sea-port of the island of Cyprus, anciently called "Cerynia." The walls, which are about half a mile in circumference, appear to be erected on the foundation of the ancient walls. This place has one entire church, and two or three in ruins. Its chief trade is with Caramania, whither it exports rice and coffee brought from Egypt, and whence it brings back storax, and a great number of passengers. Gerines is the residence of an Aga and Cadi: 16 miles N.N.W. of Nicosia.

**GERINGSWALDA**, a town of Saxony, in the circle of Leipzig; 20 miles S.S.E. of Leipzig. N. lat. 51° 5'. E. long. 12° 46'.

**GERIS**, a town of Egypt, on the left bank of the Nile; 8 miles N. of Ashmunein.

**GERISA**, in *Ancient Geography*, a town of Africa Propria, situated between the two Syrtes. Ptolemy.

**GERISAU**. See **GERSAU**.

**GERKOW**, **JORKOW**, or *Borsk*, a town of Bohemia, in the circle of Saatz; 22 miles N. E. of Saatz.

**GERLACH**, **STEPHEN**, in *Biography*, was born at a village in Swabia in the year 1546. He laid the foundation of a learned education at Stutgard, and became distinguished for his diligence at the university of Tubingen, where, in 1566, he took his degree of B. A. with great applause. Shortly after this he withdrew from the university on account of the plague. He was admitted to the degree of doctor in philosophy in 1567 at Esslingen, and in 1573 he accompanied an embassy from the emperor Maximilian II. to the Turkish court. He continued at Constantinople about five years, acquainting himself with the manners and religion of the Turks and Greeks, and cultivating an acquaintance with the most eminent men in the latter communion. Upon his return to Tubingen he obtained other preferment, and engaged in the duties of his profession with so much zeal and assiduity, as to injure his health. He died in 1612 in the 66th year of his age. He was author of "An Epitome of

*Ecclesiastical History*;" of "A Journal of the embassy sent to the Porte by the emperors Maximilian II. and Rodolf II.," abounding in curious and interesting particulars, historical, ecclesiastical, and theological: and numerous theological "Dissertations," &c. Moreri.

**GERLATZKOI**, in *Geography*, a fortress of Russia, on the E. side of the Irtisch, in the government of Kolyvan; 212 miles W. of Kolyvan. N. lat. 54°. 20'. E. long. 75° 24'.

**GERM**, in *Vegetable Philosophy*. See **EMBRYO**.

**GERM**, in *Navigation and Commerce*, the name given in Egypt to small vessels which serve to carry European merchandise from Alexandria to Rosetta, and to bring back to Alexandria the commodities of Egypt and Arabia. These vessels are a kind of strong barks, tolerably constructed; without decks, drawing little water; and, according to their size, having two or three masts with very large latine sails, the yards of which are fixed to the heads of the masts, and cannot be lowered, so that, however bad the weather may be, the sailors are obliged to climb up the whole length of them, in order to furl the sails. They are, in general, of about five or six tons burden. Goods are often damaged in these uncovered vessels, and the navigation of them is dangerous in a rough sea. Although the distance which they have to sail is scarcely more than 12 leagues, and though the bay of Aboukir, which is in the middle of their passage, affords them safe shelter, this coasting trade is not free from danger, especially at the mouth of the western branch of the Nile, formerly called the "Bolbitic," now "the branch of Rosetta;" where is a bar formed by the sand, upon which the waves, driven by the wind from the offing, and opposed by the stream of the river, break with great fury. A small island, dividing the entrance of this branch, leaves on each hand a narrow passage, called in the language of the country "Boghafs," a canal or strait. But there is only a narrow channel of this passage which is securely navigable; for it is continually shifting, on account of the instability of the bottom and the agitation of the sea. A pilot, "Reis," or master of the "Boghafs," is continually employed in founding this changeable passage, and indicating it to the "germs." In spite of all these precautions, they often get on shore; and, being soon overwhelmed with water and sand, perish with their crews and cargoes.

**GERMA**, or **GERME**, in *Ancient Geography*, a town of Asia, upon the Hellespont; which, according to Ptolemy, was a colony founded by the Gauls, named Tolistoboians, in Galatia.

**GERMAIN**, **COUNT St**, in *Biography*, a conspicuous person of a mysterious character, who resided in England a considerable time, and of whom nothing was certainly known, but that he was a fine performer on the violin, and an elegant, though not a learned or original, composer. Being here at the same time as prince Lobkowitz, they were inseparable. He printed a book of violin solos to present to his friends and admirers, which he called "La Musique raisonnée," in which there were elegant passages, singular movements, and amusing *concerti*. In his songs, the melody was Italian, and in good taste; but the accompaniments were thin, and without carrying on any ingenious design. It was reported, that when examined before the privy council, during the rebellion, he was obliged to disclose, "sub sigillo confessionis," that he was originally a musician by profession; but that by play, and his *bonnes fortunes*, he had realized an independent fortune; but this, like newspaper reports, *merits confirmation*.

**GERMAIN**, **St**, in *Geography*. See **St. GERMAINS**.

**GERMAIN**, **St**, a town of France, in the department of the Creuse, 15 miles N. W. of Gueret.—Also, a town of France, in the department of the Aube; three miles S. W. of Troyes.

—Alfo, a town of France, in the department of the Orne; fix miles S. of Belleme —Alfo, a river of America, which runs into the Wabafh, N. lat. 39 20'. W. long. 87 58'.

GERMAIN *d'Arce*, *St.* a town of France, in the department of the Sarthe; fix miles S. E. of Le Lude.

GERMAIN *de Belair*, *St.* a town of France, in the department of the Lot, and chief place of a canton, in the diftrict of Gourdon; fix miles S. of Gourdon. The place contains 1711, and the canton 7478 inhabitants, on a territory of 155 kilometres, in 12 communes.

GERMAIN *les-Belles-Filles*, *St.* a town of France, in the department of the Upper Vienne, and chief place of a canton, in the diftrict of St Yrioux; 16 miles S. S. E. of Limoges. The place contains 2015, and the canton 12,541 inhabitants, on a territory of 312 kilometres, in 8 communes.

GERMAIN *du-Bois*, *St.* a town of France, in the department of the Saone and Loire, and chief place of a canton, in the diftrict of Louhaas. The place contains 1684, and the canton 11,316 inhabitants, on a territory of 227½ kilometres, in 13 communes.

GERMAIN *de-Callerte*, *St.* a town of France, in the department of the Lozère, and chief place of a canton, in the diftrict of Florac; 12 miles S. E. of Florac. The place contains 1720, and the canton 12,273 inhabitants, on a territory of 332½ kilometres, in 14 communes.

GERMAIN *des Foffes*, *St.* a town of France, in the department of the Allier; 12 miles N. E. of Gannat.

GERMAIN *l'Herm*, *St.* a town of France, in the department of the Puy-de-Dôme, and chief place of a canton, in the diftrict of Ambert; 10 miles S. W. of Ambert. The place contains 1725, and the canton 10,510 inhabitants, on a territory of 232 kilometres, in 10 communes.

GERMAIN *Lambon*, *St.* a town of France, in the department of the Puy-de-Dôme, and chief place of a canton, in the diftrict of Hfioire; fix miles S. of Hfioire. The place contains 1706, and the canton 8348 inhabitants, on a territory of 130 kilometres, in 16 communes.

GERMAIN *Laval*, *St.* a town of France, in the department of the Loire, and chief place of a canton, in the diftrict of Roanne; 12 miles S. of Roanne. The place contains 1125, and the canton 8443 inhabitants, on a territory of 220 kilometres, in 16 communes.

GERMAIN *en-Laye*, *St.* a town of France, in the department of the Seine and Oife, and chief place of a canton, in the diftrict of Versailles, feated on the Seine. A palace was built here by Robert, king of France, which was destroyed by the Englifh in the year 1346; and another palace was erected by Francis I., which has been enlarged by feveral fucceeding kings, and particularly by Louis XIV.; 2½ miles W. of Paris. The place contains 9000, and the canton 14,355 inhabitants, on a territory of 107½ kilometres, in 11 communes. N. lat. 48 54'. E. long. 2 10'.

GERMAIN *du-Plain*, *St.* a town of France, in the department of the Saone and Loire, and chief place of a canton, in the diftrict of Chalons-sur-Saone; fix miles S. E. of it. The place contains 1229, and the canton 6676 inhabitants, on a territory of 130 kilometres, in 7 communes.

GERMAIN *de-Pringay*, *St.* a town of France, in the department of the Vendée, 18 miles S. S. W. of Mortagne.

GERMAIN *de-Tail*, *St.* a town of France, in the department of the Lozère; 13 miles W. of Mende.

GERMAIN *en-Jery*, *St.* a town of France, in the department of the Nièvre; 15 miles S. S. E. of Nevers.

GERMAIN *sur-Vienne*, *St.* a town of France, in the department of the Charente; four miles N. of Confolens.

GERMAINMONT, *St.*, a town of France, in the department of the Ardennes; five miles S. W. of Rechel.

GERMAN, in *Matters of Genealogy*, fignifies whole, entire, or own.

“Germani, quafi eadem ftirpe geniti.” Feft. Hence,

GERMAN, *Brother*, denotes a brother both by the father's and mother's fide, in contradiftinction to uterine brothers, &c. who are only fo by the mother's fide.

GERMAN, *Cousins*, are thofe in the firft or neareft degree, being the children of brothers or fifters.

Among the Romans we have no inflance of marriage between coufins german before the time of the emperor Claudius, when they were very frequent.

Theodofius prohibited them under very fevere penalties, even fine and profeription. See CONSANGUINITY.

GERMAN *acacia, bezoar, bible, black, coins, compaffes, emperor, empire, flute, language, meafures, monies.* See the feveral fubftantives.

GERMAN *School of Engraving.* Germany was probably the birth-place, and Italy the cradle, of that art of engraving which is performed with a view to its being afterward printed on paper. Engraving itfelf, as performed on metals, and with the instrument which is ftill in ufe for that purpofe, which in the Englifh language is termed a graver, and in French la burin, is of very remote antiquity; the Greeks of the early ages having employed it in the decorations of their fhields, pateras, and other implements of war and facriuce; and the Hebrews, and perhaps the Chaldeans and Egyptians, at a ftill earlier period; but unlefs we fuppofe (which is by no means improbable) that the art of engraving and printing from tablets of wood travelled from China to Europe, it was referved for the artifts of Germany or Italy, and moft probably the former, firft to perceive that ink might be delivered, and impreffions thus multiplied to an undefineable amount, both from the incifions and fuffaces, of engraved plates of metal, and blocks of wood.

The precise time of the difcovery has not been afcertained. The baron Heinnekin, who had excellent opportunities of acquiring information, and purfued his enquiries with zeal and accuracy, has clearly fhewn that the fabrication of cards for games of chance was firft praftifed in Germany, by means of the art of engraving, and was in ufe fo early as the year 1376. Not long afterward, the fame art that had been fubfervient to amufement, was employed to gratify and diffeminate fuperftition, and extremely rude outlines of faints and legendary tales, which were cut on tablets of wood, and were printed in the cities of Mentz, Strafbourg, and Haerlem, toward the clofe of the fourteenth, and beginning of the fifteenth, centuries, are not uncommon in the port-folios and bibliographical collections of the curious.

Of thefe engravings, the earlieft that is known, whole infcription contains a *date*, and which may therefore be eftemed a great curiofity, is now in the library of earl Spencer. It was difcovered by Heinnekin in the library of a convent at Buxheim, near Memmingen; its fubject is the legendary tale of St. Chriilopher carrying the infant Jesus across the fea; it bears the date of 1423, and is infcribed “Chriilopheri faciam, die quacunque tueris. Illa nempe die morte mala non morieris.” This rude but curious engraving is of the folio five, and was found carefully paffed within the cover of an old book, with a view, no doubt, to its preferation.

The fame magnificent collection of earl Spencer contains alfo one of the original engraved blocks which were ufed in the very infancy of printing, before moveable types were invented. It appears to be of the wood of the pear tree, and in the courfe of the three centuries and a half fince



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it was engraven, is here and there perforated by worms. It may be necessary to observe, that the earliest printed books were impressed from engraved blocks or tablets of this kind. To the rude representations of saints and miracles, their names and legends, cut in the Gothic character, or German text, on a scroll or label, were added, for the better information of the unlearned spectator, and in aid of the labours of the artist, if such he might be termed; and from these explanatory scrolls, the idea was first caught of printing books, to which the works of imitative art became in their turn merely illustrative. Some of these prints are simply outlines, and in others, which were produced somewhat later, shadowing, with a single course of lines, is feebly attempted. The tablet in the collection of earl Spencer, is of the former kind, and originally constituted the second leaf of the second edition (of which there is a complete copy in his majesty's library) of the history and visions of St. John the Divine. It is, probably, therefore, one of the earliest engravings on wood that was ever performed, excepting the prototypes for the playing cards, which have been before-mentioned, and perhaps the oldest of which the original tablet itself is still extant. Hence it appears that the art of engraving is the parent of that of printing, and that at least that branch of printing which delivers the ink from the surface of the engraving, and which is now termed letter-press printing, originated in Germany.

The present writer conceives that a great deal too much of spurious importance has been attached to the invention, as it has been termed, of printing; that the traffickers in its productions, by diverting the attention of those who might else have become men of taste, from its true mark, have stifled or intercepted much of the pleasure which the engravers' art is capable of imparting; and that the philosophy of engraving lies buried alive under a heap of rarity and early rubbish which has been piled, and is still piling, on it without mercy, from the shovels of dealers, collectors, and those who have, unfortunately for society, nothing better to do than to labour under them.

A knowledge of the era, and of the author of a *great* work, or an useful invention, is certainly desirable. Beside that it is necessary to the truth of history, it seems to assist us in indulging the amiable sentiment of gratitude. It would call forth our sincere regret, if the name of the author of *Paradise Lost*, or the *Cartoons*, or *Principia*, had sunk in oblivion. But at the time which we are considering, paper and ink were in constant and daily use; and impressions from dies and from seals had for ages been taken, and were under hourly observation; it therefore required no protracted train of thought; no long connected chain of causes and effects; no mighty genius, like that of Homer, Michael Angelo, or Newton, to perceive that impressions might also be taken either from the surfaces or incisions of engraved blocks or plates. The art of printing, as I conceive, originated in a concurrence of circumstances entirely independent of the minds or studies of its reputed inventors. We have seen that at first, when it was coarsely performed, and (like the tops of ballads, and the dying speeches of criminals at present) grossly addressed itself to the lower classes of the community, it was regarded as of very little consequence; and though Koster, Guttenburg, and Faust, cannot be ranked in the class of inventors, the inferior merit of perceiving that the arts of engraving and printing might be applied to purposes of greater magnitude and importance than had hitherto been observed, may be justly claimed for them. It is the important consequences gradually resulting from the discovery, that have made us attach a degree of credit to the name, and entertain an un-

merited respect for the supposed researches, of the discoverer, to which, in point of real ingenuity, the maker of the first pair of spectacles or stockings, or the first sheet of paper, would be far more justly entitled.

In tracing effects to their true causes, it ought not to be forgotten that the great benefits we have derived, and continue to derive, from engraving and printing, ought, in fairness, to be partly ascribed to the discovery of the means of converting rags into paper: this probably helped to suggest the idea of printing, and perhaps two centuries and a half had scarcely more than brought this invention to the degree of perfection necessary for the reception of impressions from printing types and engravings. Had the modern art of making paper been known to the ancients, we had probably never heard the names of Faust and Finiguerra, for with the same kind of stamps which the Roman tradesmen used for their pottery and packages, books might also have been printed; and the same engraving which adorned the shields and pateras of the remote ages, with the addition of paper, might have spread the rays of Greek and Etrurian intelligence over the world of antiquity. The process of printing is indeed so simple in itself, and was so nearly obvious in the state of things we have just attended to, that a child at play, who wanted to multiply a given form, might almost be ashamed not to have perceived it: and we ought rather to wonder it was not discovered sooner, than that it was discovered so soon.

The art of engraving and printing from tablets of wood, then, may be said to have been rather discovered than invented in Germany, and rather seen than discovered. That it was little thought of at the time, may be inferred from the number of wood cuts, the production of this period, which appear without either dates or the names of their authors, who were at once the designers, engravers, and printers of their own works, but who deemed those works of too little importance to claim for themselves distinction on account of having performed them.

For the accommodation of those persons who could not afford to purchase manuscript copies of the Old and New Testaments, beside the apocalyptic visions of St. John the Divine, which has been already mentioned, a small folio volume, entitled "*Historie Veteris et Novi Testamenti*," (commonly known by the name of "*The Poor Man's Bible*,") was published about this time, or soon after. In the same manner as the former, each leaf, printed from a single engraved block of wood, consisted of a mixture of reading with pictorial representation, such as it was; to which colour was in some instances afterwards added with the hair pencil, or some such implement. The printing was performed only on one side the paper, and two of these leaves being pasted together have the appearance of a single leaf printed on both sides. Copies of these early wood cuts, sufficiently faithful, may be seen in Strutt's *Biographical Dictionary of Engravers*. As the title of this anonymous and undated book (*the Poor Man's Bible*) imports, its publication was regarded merely as a cheap contrivance for disseminating the knowledge of holy scripture. Other books of engravings, printed in the same manner, were soon afterward produced, among which are "*Historia beatæ Mariæ Virginis*," "*Ars Memorandi*," "*Ars Moriendi*," and "*Speculum Humanae Salvationis*;" but we pass over, as of minor importance, all particular mention of these and various other engravings on wood by unknown workmen, which were apparently executed in Germany, about the time now under our observation. The next work which bears a date after the print of St. Christopher and the infant Jesus, and the first engraved book which bears date at all, is called "*the Chiromancy of Doctor Hartlieb*." It consists of twenty-four small folio leaves, printed on *both* sides.

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sides. "At the beginning of this curious book," says Strutt, "is a large vignette, representing Dr. Hartleib kneeling and presenting it to the princess Anne, who is seated upon her throne; and the names of these two personages are engraved at the bottom of their portraits. The prints in this book are exceedingly rude; but have not, as far as one can judge from the copy of one of them, given in the "Idée générale d'une Collection complète d'estampes," the appearance of being so ancient as those in the Apocalypse, or Poor Man's Bible. This curious compilation is dated 1448, and the name of Jorg Schapff, the artist, who is supposed to have performed the engravings, appears upon the fourth page."

Of Hans Sporer and Johan von Paderborn, who are mentioned among the earliest German engravers on wood, we know nothing more than their names. They may perhaps be the authors of some of the works we have enumerated.

Johan Schnitzer executed the geographical charts for the edition of Ptolemy, printed at Ulm in 1486. His map of the world is ornamented with ten rude heads, which are intended to represent the winds, and is inscribed, "Insculptum est per Johannem Schnitzer de Arnheim."

Sandrant indeed mentions and copies a print, which he believes to bear the date of 1455, and which is marked with a cypher, such as the reader will find in our first plate of the monograms, &c. of the German school of engravers. As this cypher is composed of the initials of Hans Sporer, it may possibly be from his graver; yet neither Sandrant, nor the author of "The little chronological Series of Engravers," which was printed at Cambridge, ascribe it to him; the latter asserts in his preface, that the two fives in the date, or what Sandrant supposes to be such, are intended for fens; which makes a difference of twenty-two years in the age of the print, and brings it down to the time when the elder Schauflein is believed to have flourished.

The subject of the above print is a young woman caressing an elderly man while she steals his purse; a subject which has been often repeated by other masters, both on copper and on wood.

In what part of Germany, Hans or John Schauflein was born does not appear. Strutt says, "his prints are executed in a bold spirited style, and the compositions shew him to have been a man of genius, though the stiff manner which characterized the early German masters obscures much of their merit. Besides which they are incorrectly drawn; the extremities of the figures, in particular, are very defective. Schauflein usually marked his prints with an H and an S; or an I and an S joined together in various ways." To these he sometimes added a baker's peel, which formed a pun upon his name, a peel, in the German language, being called *Schaufel*, and the word *Schauflein* signifying a little peel. At other times we find prints of this early period, marked with two little peels crossing each other, which perhaps may mean the two Schaufleins, if they ever worked in conjunction.

The works of the elder Schauflein are chiefly very small, and he is therefore classed among "the little masters." The most remarkable of them are, "A Crucifixion, with St John, the Virgin, and two Soldiers;" "The Virgin and Child;" "St Christopher," and "St. Laurence in Conversation with St. Augustin;" these are all of the circular form, and each about two inches and a quarter in diameter.

The principal wood cuts by the younger Schauflein are as follow, "Adam and Eve," a small upright; "Lot and his Daughters," a middling-sized print, length-ways; "Christ preaching to the Multitude from the Ship;" a middling-sized print, length-ways, marked with an I and

an S joined together, without the peel; "The Life of Christ;" a set of middling-sized upright prints, in quarto; another set of "The Life of Christ;" in an octavo volume, consisting of 37 prints, entitled "Vite et passio Jesu Christi," &c. published at Francfort by Christian Egolophus, A. D. 1537. To these are added, "Historie Evangelio;" containing the miracles, parables, &c. of Christ, in thirty-six prints, the same size as the above, and printed on both sides. These are marked with the I and S joined together upon the peel.

This artist is presumed by Strutt to have also engraved on copper: but perhaps "the very free etching of a landscape," if not the plate executed with the graver, of "Soldiers conversing," of which this author treats, may be the work of a third engraver of the same surname. The date of the latter is 1551, and Strutt has previously recorded of the third Schauflein, that he has seen by him a print of two men fighting, cut on wood, in a coarse but spirited manner, and a very fine masterly etching in the style of a painter, representing a large company at an entertainment in a garden; which prints prove him to have been a man of great abilities. He was probably of the same family with the former two.

In the year 1493, appeared the celebrated Chronicle of Nuremberg, which was compiled by Hermann Schedel, a folio work, ornamented with a considerable number of engravings on wood by Wilhelm Pleydenwerff and Michael Wolgemut. These engravings are greatly superior to all that had previously appeared in Europe, and consist, for the most part, of figures of various kinds, and landscapes which, though professedly views of certain cities, towns, &c. bear so little resemblance to those places respectively, that they are probably altogether the work of fancy. They are, however, cut in a bold and spirited style, and the characters of the heads are in some instances far from being badly delineated, though that meagre stiffness is every where prevalent, which so strongly marks the early art of Germany.

Pleydenwerff was a native of Germany, and perhaps of Nuremberg, but it does not appear that he ever engraved on copper, or used any monogram or other mark by which to distinguish his engravings from those of his associate.

Michael Wolgemut, or Wolgemuth, was born at Nuremberg in the year 1434. He is said to have been instructed in engraving by a certain Jacob Walch, but both Strutt and Huber doubt this fact, grounding their doubt on the want of resemblance between the styles of design and engraving of these two masters. Walch does not appear to have engraved at all upon wood, whereas Wolgemut did little else. The engravings on copper attributed to Wolgemut do not bear even a distant resemblance to those of Walch. The latter was a tame artist, or rather workman, and his work characterized by labour and care, which is generally ill bestowed; whereas Wolgemut may even be termed an artist of genius, a word, by the bye, which seems to batter down the argument of Strutt and Huber, since if a man of genius study under a mere manual workman, as by chance he may, he will certainly emerge from the style, or want of style of his master.

Wolgemut did occasionally engrave on copper, but his works on wood are far more numerous, and more generally known. In Strutt's account of this artist, he says, "we have some few excellent engravings on copper, executed about this time: these have much of that spirited style in them which appears in the wooden cuts of Wolgemut; they are marked with a W surmounted by a small o, and these prints, I verily believe, are the production of his graver."

He

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He proceeds to describe one of the rarest and best of these prints which he found in the collection of the late Dr. Monro. It is ten inches and a half high, by seven and a half in width, and represents an old man seated in a praying posture. He has a standard resting upon his left shoulder, and a book before him. Behind him is an armorial shield, with three different bearings; and, at the bottom, a cave with a gate before it. Above the figure is a scroll, upon which is written, "see Willhelme Dux Aquitaine et Comes Pic-tarientis." The head of this figure is well drawn; the hands are marked in a spirited manner, the folds of the drapery are broad, and boldly expressed, and the whole is composed in a style which does much honour to the artist. With respect to the mechanical part, it is executed with the graver only, in a dark, clear style, yet without formality, so as to have the effect of a neat etching.

It is no small addition to the honour of Wolgemut, that he was the tutor of Albert Durer, a name so greatly celebrated in the annals of engraving.

Arrived at the period when engraving both on wood and on copper began to shine forth with superior lustre in Germany, it is necessary to look back a few years in order to note the introduction of the latter branch of the art, into that part of Europe.

The reader will find under the article *ITALIAN school of Engraving*, the popular and perhaps the true account of the discovery of the mode of printing from the incisions of the graver, which, soon after the middle of the fifteenth century, was introduced into Germany. As the first engravers on wood were the manufacturers of playing-cards, (called *Formschneiders* and *Briefmalers* in Germany and in France,) so the earliest modern engravers on metal, both in Germany and Italy, were goldsmiths, and the first artist who eminently distinguished himself in the former country was Martin Schöen.

Yet having already mentioned Jacob Walch of doubtful chronology, it may not be improper in this place to add, that this engraver was particularly fond of introducing Gothic architecture into his prints, in the delineation of which he took no small pains; but, from a want of knowledge in perspective, his designs of this kind are sadly confused. He drew very incorrectly, and his compositions are in the extreme of that stiff and meagre taste which characterizes the early productions of the German school. His mark, consisting of the initial letter of his surname and a kind of lozenge cross, may be seen in our first plate of monograms, &c. of the German school of engravers; but it is to be observed, that there are some few prints marked with the cross only, which have the appearance of being more ancient than those which are marked with the W and cross.

Of the former kind are, "a hairy, wild, Man fighting with a Bear," and "a Woman seated, caressing a Unicorn," both small, and of the upright form.

Of the latter kind (marked with the W and cross,) a Gothic ornament with a crozier, a large upright; "The inside of a Gothic Edifice," a middling-sized circular plate, "A Ship striking against a Rock," with the inscription, "Hoerdze" in German text, a small plate; a set of military subjects, small, and another of saints standing in Gothic niches, small uprights; "Three Skulls in an Arch, ornamented with Gothic work;" and "The Genealogy of Jesus Christ," wherein saint Elizabeth appears on a throne, reading, with the Virgin Mary and infant Christ below. On the right hand is David with his harp, and on the left Aaron. Behind the throne arises a genealogical stem of the lineage of Christ from David to Joseph, represented (as

usual) by half figures. This last is a large upright print.

Martin Schöen, or Schön, or Schöengauer, called by the foreign writers on art, Le Beau Martin, or Hüfse Martin, and mistaken by Vafari Martin of Antwerp, was born at Culmbach, a small city in the circle of Franconia, in the year 1420. He was educated a goldsmith, and a certain Luprecht Rust, and Francis Van Stofs, or Stohlzirs, have been mentioned as his tutors. At the age of forty, and probably before, he distinguished himself by his extraordinary powers in the arts of painting and engraving, particularly the latter, and died at Colmar in 1486. His prints are without dates, but he, rather than any other man, may claim the honour of having been the first to practise the art of engraving on plates of metal, with a view to their being afterward printed on paper.

Schöen engraved from his own compositions; his plates are numerous, and shew that his mind was fertile and vigorous. If it was not sufficiently vigorous to burst the Gothic fetters which at that time manacled the taste of Germany, his admirers may solace themselves by doubting whether the unassisted powers of any individual whatever would have been found adequate to so difficult an occasion. The tyranny of established custom is probably not less stern and unrelenting in the arts of design than in those of education.

How the stiff and meagre manner,—the angular draperies and emaciated forms which characterize the early productions of the Germans, came to prevail among the Gothic and Celtic nations, from whom they derived them, is a curious, and perhaps not an unimportant, question. By comparing the early efforts in art of all nations of which we have any memorials, we may be led to infer, that man has gradually learned to see objects as they really exist in nature; the images pictured on the retina of the eye appear to be refracted in their transmission to the intellectual retina, and in every country continue to be so refracted, until, as the sun of science slowly ascends, the morning density of the mental medium is gradually rarefied; it is not less observable, nor a less curious fact, that a similar haggard lankness in the attempts of man in an uncivilized state, to imitate the human form, has almost universally prevailed, even in ages and climates the most distant from each other. The early art of Egypt, Persia, and Hindooostan, agrees in meagreness with the rude efforts of the Mexicans and South-sea islanders, and with the German art, derived from the Gothic and Celtic nations, which is now under our observation.

In the time of Martin Schöen, and Albert Durer, German art was much in the same state with European ethics: theory was separated from practice; and both art and philosophy remained perplexed with false analogies, metaphysical jargon, and occult nonsense; till Bacon, and the resurrection of the antique, referred them to the results of experience, as a criterion of principle.

Neither lord Orford then, nor any other man, should have dispraised either Schöen or Durer, for not having done, what no artist of any other school has of himself been able to perform: for, not only neither of these founders of the German school, but none of the early Italian masters, has shewn that he possessed the penetration to see beyond this gloomy exhalation from the barbaric ages, till the great examples of classic art began to re-appear, and reflect back on Nature the light they had received from her.

The works of Schöen evince a strong mind operating on the co-existing state of things, brooding over the abyss from whence the future elements of his art were to be created; and using with considerable success the materials by which it was surrounded: and it may be regarded as fortunate for

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his claims, that in the instance of his St. Anthony he has adopted a subject that in its nature set him free, or nearly so, from the Gothic bondage with which, on other occasions, his genius was shackled: he has been the first boldly to venture into the regions of Chimera, and by the potency of his art has compelled thence the demons that Callot and Teniers were afterward solicitous to invoke and proud to employ; while the expression of undisturbed faith and pious resignation in the countenance of the holy man whom they are hurrying into the air, shews that he saw and copied that portion of Nature which she did vouchsafe to unveil to him, with a clear vision, and delicate, though determined, hand. If his demons are more fantastic and less terrible than modern art would deem it proper to introduce, we should recollect that the age of Schöen was that of Ariosto, and that two centuries elapsed between the grotesque monsters of Ariosto, and the sublime demonology of Milton.

It is consonant to the progressive improvement of critical observation, that more should be known of the human countenance at an early period, (or indeed at any period,) than of the rest of the figure, because it is the kind of study and observation in which men are most interested. Accordingly, Schöen's heads are in general by far the best parts of his performances. Those of his single figures of St. Martin and St. John have considerable merit; the divine character and expression of that of his Christ bearing his cross, as it appears in the good impressions, have rarely been surpassed; and several other heads in this extensive composition possess a proportional share of excellence.

In this, as well as in several other of Schöen's prints, may be traced a latent feeling existing in the mind of their author, that the engraver's art might be rendered subservient to the expression of the various textures of substances. Nay more; this elementary principle strongly discovers itself in the manner in which he has treated the grain of the wooden cross; in the various modes he has invented of describing the different materials of dress in which the figures are habited, and in the sterility of the ground; perhaps the latter is as much the result of the necessary operation of the uneducated graver, as of study. Yet, is it in such full concord with the barrenness of the scene, and the barbarism of the subject, as to be not unworthy of favourable notice; while the whole together seems to shew that a sentiment has subsisted from the very commencement of engraving, that it was susceptible of this particular merit, and which may therefore be fairly presumed to be not founded in the fallacious refinements of modern fashion, (though perhaps sometimes run after with too much of fashionable avidity,) but one of the primary elements of the art.

The mark which Martin Schöen affixed to his works may be seen in our first plate of the monograms, &c. of the German school of engravers. Heinneken has enumerated an hundred and fifty of his engravings, most of which are much and deservedly sought after by connoisseurs. We shall begin our select list with the mention of those of which the subjects are taken from sacred history.

A Nativity, where the Virgin Mary is in the act of adorning the infant Saviour, who is lying on a straw pallet; behind the Virgin appears a bull and an ass; and in the distance St. Joseph. Three angels appear in the air, holding a seroll.

Another Nativity, where Joseph is seen in profile, holding a lantern. The bull and ass are here looking at the infant Christ; the scene in a vaulted stable, where, through an opening, are seen three shepherds in conversation, and three angels hymning hallelujahs above.

On the same plate of copper, which is still kept as a cu-

tiosity, and may be seen in the chapel of the hospital at Colmar, is likewise engraven "The Adoration of the eastern Kings." The scene here is also in a stable, where the kings are kneeling and offering presents to the infant Saviour, who is held by the Virgin Mary. This plate is very skilfully executed, and is of a small folio size.

"The Flight into Egypt," in which angels are represented assisting St. Joseph to gather dates, and lizards are introduced with both local and allegorical propriety, one on the ground, and two others climbing up a tree. This also is in small folio.

A set of ten plates of "The wise Virgins," and "The foolish Virgins," small uprights. The former bear their lighted lamps in their hands, and are crowned with garlands of flowers; the latter are trampling on their garlands, while their lamps also are on the ground.

A set of twelve small quartos from the life of Christ. In the first he is represented in prayer on the mount of Olives; in the second, arrested by the government; in the third, before the high priest; in the fourth, soldiers are scourging him; in the fifth, he is crowned with thorns; in the sixth, Pilate is washing his hands; in the seventh, he is exhibited to the multitude; in the eighth, bearing the cross; the ninth is the crucifixion; the tenth the holy sepulchre; the eleventh the descent into hell, and the twelfth the Resurrection.

A large folio of "Christ bearing his Cross," one of the most celebrated of the engravings of Schöen, and on which we have commented above.

A Crucifixion, also in folio, and which has been copied by Israel von Mecheln. The Virgin Mary and St. John are in this print represented at the foot of the cross, and angels in great affliction; "The last Judgment;" a set of twelve middle-sized uprights, of which the subjects are taken from the life of the Virgin; "The Death of the Virgin," ditto, which has also been copied by Von Mecheln and other contemporary artists, and is a composition of considerable merit, and one of the most carefully finished engravings of the matter; "St. Anthony hurried into the Air by Demons," a very capital work, of which we have already spoken, an upright folio, but not very large. A set of the apostles, very small.

Of miscellaneous subjects, Schöen has engraved "The Alchemists fighting;" "A Bishop's Crozier," in folio, in the spiral volute of which is the Virgin Mary with the infant Christ, and an angel playing on a lute; an incense-cup or censur with a chain, ditto. Twelve small plates of goldsmiths' ornaments, consisting of armorial bearings with their appropriate supporters, &c. cloving with an escutcheon, bearing the cypher of the artist himself, supported by a female; and "The Battle against the Saracens," in which St. James appears on the part of the Christians; a large folio plate, presumed to have been the last of Schöen's engravings, from the circumstance of certain distant figures toward the left hand corner being left in an unfinished state.

Bartholomew Schöen is said, by professor Christ, to have been the brother of Martin, but of the dates of his birth and death we find no account. His apparently very ancient engravings are known by his initials, having between them a mark of separation exactly resembling that which separates the initials of Martin Schöen, which confirms the probability of their having been brothers.

The engravings of Bartholomew bear that sort of resemblance to those of Martin, that a bad copy does to a good original, and in neatness and feeling are exceedingly defective. They are partly original, but the greater number are copies from the very superior prints of his brother.

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His original works consist chiefly of grotesque figures, of which some are by no means destitute of humour. It may suffice to mention the few following, which are all engraved on small plates.

A beggar man, with an old woman in a wheelbarrow; a man playing on a lute, with an old woman holding a ladle and jar; two grotesque heads of an old man and woman, marked in a better style than the former; and a lover and his mistress, a small circle.

He copied the set from the life of Christ, the large folio of Christ bearing the cross, and various other of the prints of Martin, but the copies may be known from the originals, by their inferiority as well as by the difference between the two signatures.

When a man of original genius, or one who may claim that noblest of human distinctions, the title of *inventor*, shines forth on the world, a swarm of busy flutterers round his glory are kindled into existence, buzz in his rays, and think to share his fame. Such was Bartholomew Schöen, when considered with reference to his brother; such probably were Paul and George Schöen, who have been mentioned as goldsmiths and engravers of this early period, and such were those other contemporary imitators and immediate successors of Martin, who now claim some small portion of our notice.

Of talents far inferior to those of Martin Schöen, yet engravers to whose works the virtuosi are by no means inattentive, were the Israel von Mechelns, father and son, whom Strutt has mistakenly inclined to identify, as having been one and the same individual. Both were natives of Mecheln or Mekenin, a village near Bocholt, in the bishopric of Munster, in Westphalia.

The elder Israel von Mecheln (or Mekenin) was born in the year 1424, and, like Schöen, he was by trade a goldsmith.

The year of the nativity of the younger Israel has not been mentioned. The latest of his engravings is dated in the year 1522, and he died in 1523. It has been conjectured, that he studied under Martin Schöen, from the number he has copied of that master's works, but this seems very insufficient evidence of the fact. It rather seems to shew that the barrenness of his invention corresponded with the dryness and insipidity of his style as an engraver.

The works of the Von Mecheln (*if* the father engraved) are numerous. That he did engrave, is inferred by the baron Heineken from the following circumstance. "An attentive examination (he says) will make it appear that all these prints are not by the same hand. I am almost certain that Israel, the father, engraved several, those especially which have the greatest marks of antiquity, and are executed in a rude style, approaching nearest to the work of the goldsmith. Nor, do I deny, that the son may have commenced originally as a goldsmith, by engraving armorial bearings, flowers, foliage, crosses, and other ornaments: but he was a painter as well as an engraver, and a man of tolerable ability, considering the time in which he lived."

Strutt, on the other hand, can see no reason for dividing the works which pass under this name, nor can he find any other difference in the prints than might reasonably be expected in the works of an individual artist, who performed so many: his most early productions being of course the rudest, but all equally defective where he has attempted to express the naked parts of the human figure.

The difficulty, and the importance also, of the question, ceases, when we reflect that it was part of the professional business of the goldsmiths of that day, in which every ap-

prentice was instructed, to ornament their productions with engraving.

Of these engravings, so little worthy of learned controversy, the principal are; the portrait of the senior Mekenin, an elderly man with a long beard, his head dressed with a turban. The plate is in quarto, and bears the inscription "Israel von Meckener, Goldschmit." Ditto of Mekenin, junior, and his wife, inscribed "Figuracio facierum Israel. et Ite Uxoris, I. V. M." in 8vo.

"The Descent of the Holy Ghost;" "St. Luke Painting the Virgin and Child," and a set of prints from "The Life of Christ;" small upright folios, though varying a little from each other in dimensions.

These are among the prints which Heineken supposes to be the work of Mekenin the father, and Strutt, the early productions of the son. They bear the evident marks of being the attempt of a novice, being wretchedly engraved and quite as ill drawn.

"Judith and Holofernes," of the folio size. In the back ground is an army, where cannon and other modern implements of war are ignorantly introduced. "The Banquet of Herodias." This also is a folio plate, twelve inches in length, and marked Israel V. M. At one end is seen the decollation of St. John the baptist: and at the other, Herodias and her father appear seated at table. "Herod's Cruelty," is a middle-sized upright.

Of holy families, the Israels engraved several, the chief of which may be known from each other by the following peculiarities. In one, the Virgin Mary, habited in a long robe, is sitting with the infant Christ, while beyond an enclosure appears St. Joseph reposing. Toward the bottom, at the right hand corner, is a small grasshopper, from which it has obtained the name of the Virgin of the Grasshopper. It is in quarto, and inscribed Israel V. M. (This plate has been copied, with improvements, both by Albert Durer and Mark Antonio.) In another, the Virgin Mary, seated in a landscape, is about to kiss the infant Saviour; the Deity appears in the clouds above; and St. Joseph sleeping. (This is a middle-sized upright, and is partly finished by means of scratcher, which are apparently made with the point of the graver, but what in the manner of Rembrandt.) In another, which is dated 1482, the Virgin and Child are surrounded by four angels. This is also a middle-sized upright.

Of other sacred subjects, we shall mention "The Annunciation," in 8vo., where an angel appears holding a scroll, on which is the motto "Ave. Gra," and the Virgin kneeling before a praying desk, on which is inscribed I. V. M. "The Death of the Virgin Mary," copied from Schöen. "The Virgin crowned by Angels, and standing on a Crucifix, while the fall of Satan is represented below," an upright folio. "The Scourging of Christ," ditto. "The Bearing of the Cross," a large folio, copied from Schöen, and two large folios of the "Crucifixion of our Saviour," which are distinguishable from each other by the following peculiarities: in the one, angels are receiving the blood from the wound of the dying Saviour, while the Madonna and St. John appear below; in the other, which is esteemed the superior work, St. John holds a book in one hand, while the other is lifted, and the hands of the Madonna are clasped; and the ground in the latter is almost left white, whereas in the former it is nearly covered with engraving.

From the legends of the Roman Catholic reliques, the younger Israel has engraved, "St. George and the Dragon," in 4to, inscribed I. V. M. Schöen's "St. Anthony tormented by Demons;" and "St. Jerome," in which the saint appears seated in a room and painting to a

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All. On the right hand corner is the lion's head. The latter has been copied by Lucas of Leyden, and in the opinion of Strutt is Israel's mallet-piece, though perhaps that distinction ought rather to be granted to his moral print of "A Cavalier and Lady, walking in amorous talk, while Death from behind a Tree is shaking an Hour-glass," a design which, whoever was its original author, had previously been engraved by Sporer or Schauslein, and has been subsequently copied by Albert Durer and several others:

Of the singular design consisting of three naked women, with a globe hanging above, which is inscribed **G. W. S.** there is also an engraving by Israel.

A folio plate of "The Death of Lucretia;" a pair in quarto, of "A Woman singing, while a Man accompanies her on the Lute," and "A Man playing the Organ, while a Woman blows the Bellows," both marked **I. M.**; Schöen's richly ornamented incense cup; and several plates of grotesque foliage and other goldsmiths' ornaments, are all that we shall mention of the two hundred and fifty engravings by the Israel which are enumerated by Heinnekin. Neither of them appears to have had any settled monogram, but marked his engravings variously, as we have stated in the course of our list, sometimes adding to his name and residence the word "Goldschmit," and at others "Tzu Bockholdt," in the German character. The best of their works, as has been before intimated, are copies from the superior productions of Martin Schöen.

Matthew, or Martin Zagal, Zafinger, or Zinck, goldsmith and engraver, was born in the year 1430, but in what part of Germany is not known, though, from the subjects of two of his engravings, it may be guessed that he was of Munich; neither is the year of his death certain, though, that he lived to the beginning of the sixteenth century, and engraved till the age of seventy-five, may be inferred from the circumstance of one of his prints being dated in the year 1505.

The extreme of Gothic stiffness appears in his works. His composition is bad, and his drawing still worse: the mechanical part of his engraving, indeed, possesses a certain degree of neatness, but is without the faintest ray of taste. It is proper, however, to observe, that from the delicacy, or rather faintness of Zagal's manner of engraving, his plates would not stand many good impressions; that many of the retouched prints, which are exceedingly bad, are abroad in the world, and that therefore, to do justice to the slender share of merit which he possessed, it is necessary to see the early impressions of his plates; nor should be left unmentioned, that in his latter engravings he displays a more intimate knowledge of perspective than we find among his predecessors in Germany. Zagal marked some of his prints simply with the initials **M. Z.**; and others, as will be found in our first plate of the monograms, &c. of the engravers of Germany. Among his best engravings may be reckoned "Solomon's Idolatry," a middling-sized upright, dated 1501. "A Holy Family," in which the Virgin Mary is receiving water from a fountain, in a cup of the same date with the preceding. "The legendary Story of St. Christopher bringing the Infant Jesus across an Arm of the Sea," a small upright. "A Lover seated in a Landscape, entertaining his Mistress," and "Two Lovers Embracing," ditto. Two large and very rare folio engravings of "The Grand Ball and Tournament at Munich;" in the former of which is represented a dance and card party, in which the duke of Bavaria is engaged at play, and in the latter a tournament, at which the duke is present. "The Martyrs St. Catherine and St. Ursula," both in 8vo. "The Martyrdom of St. Sebastian," in 4to. "The March to War," ditto, and "Aristotle the Philosopher," a subject often repeated, and

called by some Socrates and Xantippe. The last is a very rare print, in 4to.

Albert Glockenton was a native of Nuremberg, born in the year 1432, and who flourished as an engraver at the commencement of the sixteenth century; but the time and place of his death are uncertain. Strutt says of him, that if he did learn his art from Schöen, he not only imitated his manner, but copied a great number of his prints: which copies constitute the greater part of the works of Glockenton. He executed his plates with the graver in a neat but servile manner, by no means improving the drawing of his originals. He marked his engravings with a sort of half Gothic initials of his name, as may be seen in our first plate of the monograms of the German engravers, and sometimes added the date.

The principal works of Glockenton, after the originals of Martin Schöen, are "Christ bearing his Cross," and "Christ crucified;" both rare and of the folio size; "The death of the Virgin." The set of the wise and foolish virgins, ten plates; the passion of our Saviour, a set of ten others, both of which are more particularly mentioned in our account of Schöen, and the "Virgin and Child at an Altar;" in 4to. The latter is superior, in point of composition, to the German art of that period, is marked with only a Gothic **G**, and bears the very early date of 1466; which is perhaps the most ancient that is to be found on any copper-plate print whatever. Of this engraving particular mention is made under the article Glockenton, in the "Catalogue Raisonné du Cabinet d'estampes de Brandes."

Contemporary and co-equal with Zagal and Glockenton, was an engraver for whom Strutt claims a sort of doubtful existence, by the name of Wenceslaus of Olmutz, in Bohemia. He found a copy of Martin Schöen's "Death of the Virgin" in the Mouré collection, which had not only the name of this artist inscribed upon it, but the date of the year in which it was engraved, namely 1481. He adds, "there is no doubt of its being a copy from Schöen, because it bears the evident marks of a servile imitation. It is highly probable that Wenceslaus was the disciple of Schöen;"—another observation arises from a strict examination of this print, upon comparing it with the ancient German engravings marked with the **W** only; which is, that they are evidently the work of the same artist as the preceding, though they have usually been attributed to Michael Wolgemut, the master of Durer. The name is perfectly plain," but the words that follow are far less legible, and in the opinion of the present writer are much more like *Olomuce Ibidem* than Olmutz in Bohemia.

Of these prints marked with the letter **W** only, Strutt mentions the following:

The "Annunciation," where the Deity appears above and a pot of flowers is introduced on the fore-ground; a small upright; "The Cavalier and Lady heedless of Death;" "The Last Supper;" "The Crucifixion of St. Anthony;" small and nearly square; and the set of small uprights from the "Life and Passion of Christ."

The above are all from Schöen; those which follow are from the Israel of Mekenin.

"An old Man leading a little Boy, with a Woman following carrying a Girl at her back;" and "A Lover entertaining his Mistress;" two small uprights; and "The naked Women with a Globe suspended from above."

We are now again arrived at the time when the Nuremberg Chronicle was published, and those extraordinary works both on copper and on wood began to appear, which are known to the world under the highly respected name of Albert Durer.



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Of the various powers of Albert; his reputation as the father of the German school of painting; and his general merits as an artist, we have already treated pretty much at large; (see DÜRER, ALBERT.) It remains to add our list of his principal engravings, and to comment more particularly on some of those which are, and deserve to be, most conspicuous. Though the defects of the artist are pointed out in the critical remarks which follow, and which are chiefly extracted from lectures delivered at the Royal Institution in the years 1805 and 1806, yet are they calculated to lead the attentive observer to a more intimate acquaintance with the merits of this extraordinary engraver, and to confirm the general and justly merited praise which has now, for three centuries, been bestowed on Albert Durer.

The resemblances between the several objects which this master has introduced into his engravings, and their archetypes in nature, proceed, for the most part, too much upon fac-simile principles for the generalized dignity of his subjects; and his powers of imitation are too prodigally lavished upon subordinate and unessential parts.

The expression of his figure of "Melancholy," which would else have approached sublimity, is considerably injured by the introduction of a multitude of objects, most of which the mind does not readily assimilate with the sentiment of melancholy. It must first be perceived or discovered, that these objects are allusions to astrology, alchemy, and the occult sciences, as they are called. The performance addresses itself, therefore, to the curious and inquisitive part of mankind, and not to man: and as neither the eye nor the mind can at once dilate with greatness and descend to littleness, it is evident that the research it requires must be the destruction of sublimity.

Though there is nothing of the "holy calm," with which Collins has surrounded his figure of melancholy, this composition may still be thought interesting on another account, namely, as a true picture of the times in which it was engraved; for precisely thus was attention perplexed and distracted on most philosophical subjects in the age of Albert Durer; and as he is author of seven treatises, most of which are on the metaphysics of art, he had probably experienced much of that species of melancholy which proceeds from the mental exhaustion and dissatisfaction in which such studies often terminate. Regarded in this view, it is no inapt verification of the old adage, "The painter paints himself." It might have assisted to reconcile us to the defects of this performance, if Albert Durer had named it Study; or, if we could fancy the figure out of the picture, we might be content to let our attention dwell awhile on the skill with which he has represented most of the other objects, when abstractedly and severally considered. This talent, however, of representing the characters and textures of individual objects, is still more conspicuous, and somewhat less objectionable, in the print of "St. Jerome in the Room," wherein all the objects are rendered with a fidelity little short of the camera obscura. Regarding the art as in its infancy, we may look at this engraving with the same kind of pleasure, (and we should at all the works of art of this period, with the same candid indulgence) with which Reynolds contemplated "The Virgin and Child" by Van Eyck, in the cathedral church of Bruges—"the artist," says Sir Joshua, "having accomplished the purpose he had in view."

Another of the most celebrated, though not the best, of Durer's engravings, is his "Adam and Eve." He has, in this instance, had recourse to nature for his models, but his Eve is not "the fairest of her daughters," nor his "Adam the goodliest of men since born;" yet we may perceive that he selected from the nature with which he was ac-

quainted; and though we do not behold the symmetry and superlative grace of Greek beauty, we probably see the first and acknowledged beauty of Nuremberg. It will also be allowed, that the Paradise they must shortly quit, does not seem very desirable to inhabit: here is no genial light, no luxuriance of vegetation, and no abundance of animal life. To use more of the words of Milton, nature is so far from wanting as in her prime,—so very far from playing at will her virgin fancies, that she appears, in those of Shakspeare, "bald with dry antiquity:" yet if Raphael has violated this cardinal principle of propriety, by erecting a church, and houses two stories high in his Paradise, who shall throw the first stone at Albert Durer? The boles of his trees, though among the first, if not the very first that were ever engraven, have much of the truth of individual nature, and their foliage, and the fur of the cat, are expressed with a degree of freedom that must surprize those who reflect that no etching has been employed, and how comparatively ill calculated are the sleek and stiff lines of the unassisted graver to the expression of such objects. The introduction of the cat and mouse in Paradise could not fail to be understood, from its familiarity; but though ingenious, this very familiarity rendered it unfit for the occasion. The prophet Isaiah has far more nobly expressed the primeval harmony and happiness of the brute creation.

The Eve of Albert Durer is apparently of the same family that Otho Venius, and Rubens, afterwards adopted for their models; and in the engraving which collectors call "The Death's Head," is a female figure, which still more evidently shews the esteem in which Rubens must have held the works, or at least the women, of Albert Durer. It is not easy to conceive the occasion that could have given birth to this mysterious print of Death's head. It presents us either the ordinary routine of human life in allegory, or perhaps a sort of poetic armorial bearing. The crest is a winged helmet, richly ornamented, and beautifully executed; and though a skull, which one should think could not fail to be an awful monitor, is highly embossed on the shield, the female supporter, heedless of her charge, heedless of the moral lesson, and of the moral character she has to sustain, is obviously listening to the very suspicious suggestions of a sort of savage man. It appears to be one of the night thoughts of Albert Durer, and perhaps, like those of Dr. Young, may be intended to mark the lamentable influence of the grosser passions. Whatever its author may have intended to inculcate by this print, its execution as an engraving is admirable. The helmet, with all its pomp of heraldic appendage, and the actual and reflex lights on its polished surface, are characteristically, though minutely, expressed; the skull is accurately drawn, and its bony substance is described with a masterly hand; the author has even sedulously attended to the finer enamel of its two remaining teeth. The head of the savage, with its beard and wild redundancy of snaky tangled hair, has considerable and well-managed breadth of light and shade, though its character is far less savage than should seem to belong to the rest of the figure: its expression is, doubtless, meant to be assumed and insinuating. The countenance of the female has seldom been surpassed for that successful mixture of character and expression that lends a willing ear to a delusive promise; and the hands of both figures are far better drawn than we have hitherto seen among the productions of the German school: the drapery also, which we have been accustomed to see stiff, starched, and complicated, is here relaxed into freedom and simplicity, and is so remarkable for silky texture; approaches so near to what is now termed picturesque composition of forms and light and shade; and

is, on the whole, so superior to that of his Melancholy, and some other of his subsequent works, as leaves us either to wonder that Albert Durer, having once attained, should ever lose sight of the excellence of its principles; or to infer that he did not perceive their excellence, or that the science he deduced from his own observation of nature prevailed but occasionally over the prejudices of his education.

In his small prints of the life of Christ, of which Marc Antonio is said to have pirated the copy-right, other instances occur of this style of superior simplicity in the draperies, and some of broad and captivating effects of light and shade. His Jesus Christ suffers greatly, or beams with God-like benevolence; his Magdalens and Madonnas are sometimes divinely pathetic; and many other of the heads in these intersting and often grand compositions, are exquisitely finished miniatures, remarkable for that sort of accordance and consistency of parts which we deem the internal evidence of truth and nature. The principal portraits of Durer, engraved on copper, are those of the elector Frederic of Saxony, dated MDXXXIII. Albert, elector of Mayence, dated 1523. Bilibald Pirkheimer, dated 1524. Melancthon, dated 1525. These are all of the quarto size.

In folio he has engraven his friend Erasmus, good impressions of which are now become very rare, dated 1526, and two figures of himself, on the same plate, one being his portrait in the year 1509, and the other in 1517. They stand on either side of a piece of architecture.

Of the portraits of Durer, it may with truth be said, that, in point of drawing, they possess the same internal evidence of correctness which distinguishes the best of his historical heads: in style they are laboured; but the labour is not ill-bestowed; and the chiaroscuro is frequently comprehensive and clear. His compositions from holy writ, and those legends which in his day were thought to be nearly of equal authority, are numerous. The principal of those on copper are "The Adam and Eve in Paradise, or Sin of our first Parents," which has already been the subject of detailed comment, a very elaborate work in folio, dated 1504. Another "Adam and Eve," which represents them after their expulsion from Paradise. "Adam crawling, and Eve sitting with an Infant at the Entrance of a Cavern," in quarto. "A Man with a Beard, seated on the Ground (his Horse fastened to a Tree) caressing a Young Woman," a small quarto plate, known by the name of "Judah and Tamar," and believed to be the earliest of Albert Durer's engravings. "The Nativity," where the Virgin Mary is adoring the Infant Christ, while St. Joseph is drawing water from a well. "A Holy Family," known, among connoisseurs, by the title of "The Virgin of the Butterfly," where the Madonna is seated in a landscape, with the infant in her arms, and St. Joseph asleep near her. Another, known by the title of "The Virgin of the Ape," where the Infant Christ, kneeling, is playing with a bird, and an ape is tied near the group. Another, known by the title of "The Virgin of the Pear," which is dated 1511, where the Infant Christ, holding a pear, is sitting with his mother at the foot of a tree. Another, known by the name of "The Virgin of the Apple," which is dated 1514. All of them are of the 4to. dimensions. An etching of the "Holy Family," in tolin, wherein the Virgin Mary is standing and holding the Infant Christ in her arms, and a girl is introduced at prayers, dated in the year 1519. A set of fifteen, including the frontispiece, entitled "The small Passion," very rare, and dated from 1507 to 1512. "Christ Crucified, with the Holy Women at the Foot of the Cross," a small circle,

without the artist's mark, and said to have been done for the sword-belt of Charles V. "The Saviour prostrate in the Garden of Olives," very rare, and dated 1515. "A Group of Angels bearing the Instruments of Crucifixion, &c." engraved on tin, or iron tinned over, and dated 1516. "The grand Ecce Homo," in large 4to. with a Latin inscription, and dated in 1512, a very rare print, much sought after by connoisseurs. "The Entombing of Christ by the Holy Women," in small folio, a print dated 1507, and in which several cats are strangely introduced, but which some think is not by Albert Durer. "The Infant Prodigy," a kneeling figure, in folio: some pretend that this is a portrait of Durer himself. "St. Hubert at the Chase," a folio print, in which the saint is represented kneeling before a crucifix, which appears upon the head of a stag! the scene is a wood, with a castle at some distance.

Albert Durer has been analogically compared with our poet Spenser, and it has been remarked, that "if any one of his performances were to be pointed out as more particularly resembling Spenser, it should be that of the Legendary Tale of St. Hubert. They are characterized by the romantic heights of extravagance; the same abundance of ideas; the same unremitting and successful attention to minute excellence; the same general air of incredibility rendered credible, and, as we should say now, if the works of the poet and engraver were now produced for the first time; the same want of concentration, brevity, and general effect; but a temporary adoption of the sympathies of the sixteenth century, as far as art is concerned, reconciles us to these."

Of the subject of St. Jerome, Durer has engraven two plates in small folio, on one of which, where the saint is sitting in a chamber, we have already commented; in the other he is kneeling before a crucifix, in a rocky desert, and the engraving is far less elaborately finished than the former.

"A naked winged Woman standing on a small Globe suspended in the Clouds, holding in one Hand an elaborately wrought Cup, and in the other a Bridle," a folio print, known among dealers by the name of the Larger Fortune. According to Vasari, it should be called Temperance, according to others, Prudence: but, perhaps, Albert Durer meant it for the Guardian Genius of Nuremberg, of which city a bird's eye view appears beneath.

Another "Naked Woman on a Globe," in 12mo., called the Lesser Fortune. She holds a long stick and a thistle. The figure of "Melancholy," on which we have already commented. She is sitting, her head resting on her hand, surrounded by various emblems, a folio plate, of exquisite workmanship, dated 1514. "The Dream of M. Wolgemut," where he is represented asleep near a frying pan: the devil is behind with a large pair of bellows, and on the side Venus, with Cupid walking on shells. "The goat Satyr," who is attacked by a fawn whilst reposing with a nymph, a small folio, the work of the graver, and performed with admirable skill. "The Sorceresses," four naked women in a room: a globe, with the letters O. G. H. is suspended from above, and in an adjoining chamber appears the devil surrounded by flames: it is dated 1497. Baldinucci thinks it is the earliest of Durer's engravings. It is copied from Wolgemut, and is a rare print. "A Cavalier on Horseback, and in complete Armour, pursued by Death on Horseback, (who is holding forth an Hour-Glass,) and another Spectre:" this is a very highly finished and exquisite engraving, in small folio, of which good impressions are rare. It is by some termed "Death's Horse," and by others, with more propriety, "The Worldly Man:" it is dated

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dated 1513, and the impressions which were taken before this date was inscribed, are much valued. "The Death's Head," of which we have already given a particular description, in small folio, dated 1523. Another heraldic subject of the same dimensions, displaying a lion rampant on a shield, and a helmet surmounted by a cock spreading his wings. "A large Horse," behind which marches an armed man with boots, bearing a halbert, and another horse of more beautiful form, behind which marches another armed man with a halbert, having a griffin on his helmet: both in 4to., and dated 1505. "A dishevelled Sorceress, mounted on a He-Goat, and flying through the Air, with a Distaff in her Right-Hand." "The Prodigal Son," a small upright folio, of which the impressions, before the date 1513 was added, are held in most esteem.

Under the article *ETCHING* we have ascribed the invention of this mode of art to Albert Durer. The earliest of his etchings, which bears a date, is called "The Rape of Proserpine," a folio print, dated 1516, and in two years afterwards appeared his more celebrated etching of the march of an army, which has been called "The Cannon," from a large piece of ordnance forming the principal object on the fore-ground: the scene represented is the entrance of a village, with a bird's eye view over an extensive country, and three Turks are introduced near the fore-ground. Both these etchings are reported to have been performed on plates of iron or steel; and the latter, which is now become rare, is among the largest of the works of Albert Durer.

The principal of those works of our artist which are commonly supposed to have been engraven on wood, are as follows:—The portraits, in folio, of Albert Durer, inscribed "Albrecht Durer counterfeyt in seinem alter des LVI." without the engraver's cypher; another with his cypher; the emperor Maximilian I; a bust with numerous ornaments, inscribed "Imperator Cæsar Divus Maximilianus Pius Felix Augustus 1519;" Ulrichus Vambuler, a rare print, with the following inscription on a shield, "Albertus Durer Noricus reddere que conatur 1522."

From the numerous historical works which Durer performed in this manner, we select the following: A set of thirteen folio prints, including the frontispiece, from the life and passion of Jesus Christ, inscribed "Passio Domini, &c." dated 1510, 1511. A set of twenty-seven small uprights, known by the name of the Smaller Passion, and inscribed "Figuræ Passionis Domini Nostri Jesu Christi 1519, 1520." An "Ecce Homo," in folio, engraved in a bold and broad style, and with great freedom. "The Holy Trinity, surrounded by the Angelic Host," and dated 1511. Another "Ecce Homo," known by the title of "The Mystery of the Mass." A set of sixteen folio pieces, inclusive of the frontispiece, of which the subjects are taken from the Apocalypse, and the text printed on the reverse of every leaf. A set of twenty-two small folio prints from the life of the Virgin Mary, dated 1509, 1511: seventeen of this beautiful set of engravings were copied by Marc Antonio at Venice, to all of which copies, except one, the Italian artist added the cypher of Albert Durer. "The Holy Family," of the folio dimensions, where St. Anne holds the infant Saviour, and the Virgin Mary is in the act of adoration. "The Rhinoceros," a rare print, in folio, with a German inscription, dated 1515.

In *clair-obscur* (or *chiaroscuro*) printed from a succession of blocks, the following are ascribed to Albert Durer: "A Holy Family in a Landscape:" two angels are crowning the Virgin Mary, and on the fore-ground are three rabbits; in large folio. Two, of legendary stories from the lives of St. Augustin and St. Christopher, in large folio, the latter of

which is scarce. A sort of apotheosis of the emperor Maximilian, where, accompanied by the Virgin Mary and numerous saints, he is adoring the Saviour. (Of this piece Huber possessed an impression volumn very richly coloured.) A pair, which are scarce, of "A Fortrefs in a state of Siege," generally called the Siege of Vienna, dated 1527. A set of six ornamental designs for tapestry, of astronomical subjects. The whole number of engravings by Albert Durer, and after his designs, are stated to amount to 1214; but Mariette's collection amounted to no more than 420, which were sold at his death for 1830 livres. See the article Durer in the Catalogue Raisonné of the Brandes cabinet.

The triumphs of the emperor Maximilian, which, when pasted together, form two very large and long prints of the frieze form, have been generally ascribed to Albert Durer, but the researches of Mr. Douce of the British Museum, and Mr. Edwards of Pall-Mall, have determined that they are the performances of various other artists, though perhaps executed under the general superintendance of Albert Durer.

Lucas Cranach, or Kranach, was born at Cranach, in Westphalia, in the year 1472 or 1474, and died at Weymar in 1553. He was educated a painter; yet whether he studied under any other master than his father has not been recorded. He passed several years in the service of the elector of Saxony as an artist, distinguishing himself by his engravings on copper and wood, and in that manner which is technically called *chiaro-scuro*. His fertility of invention far outran his judgment: led away by the liveliness of his fancy and talent for composition, he took such forms as were before him, following the stiff Gothic taste which prevailed in his country at the time, without attempting to improve it. His manner of drawing is rather dry and tasteless, than absolutely incorrect, but his heads have a moderate pertion both of character and expression, though they are not marked with precision or in a pleasing style: his hands and feet are very defective, and a total ignorance of the art of distributing light and shade confuses his effects.

Cranach sometimes marked his plates with the initial letters of his name: and sometimes with the cypher, but more frequently with the dragon holding a ring in his mouth, which will be found in our first plate of German marks and monograms. The dragon is the crest of the elector of Saxony, to which, on some occasions, Cranach added the electoral shield.

The following will probably be found among the best of his engravings, beginning with those which are executed on copper: Portraits of Jean Frederic elector of Saxony, where an angel appears on high with a crown of Javel, in large 4to. and very rare. The two electors of Saxony, Frederic and Jean, the former of whom is holding a chaplet, in 4to. dated 1510, and almost square. Christianus II king of Denmark and Norway, surrounded by ornamental architecture, armorial bearings, &c. in large 4to. Profile of Martin Luther in the habit of a monk of St. Augustin, inscribed "Des Luteri gubalt," in 4to. and dated 1523.

The chief of his historical works are: "Adam and Eve after their Fall," (called by some the Penitence of St. Chrysofom) the scene is a desert, where a naked woman and child appear on the fore-ground, and in the back-ground a man is crawling, a folio plate, dated 1509, marked with the cypher and little dragon of Cranach, and executed quite in his Gothic manner. "The Temptation of our Saviour in the Desert," where the Christ has somewhat better pretensions to merit, than generally belongs to the figures of Cranach, but the tempter is as grotesque and entertaining a devil as you would wish to see: the print is in small folio, and marked L. C. W. the last letter denoting Wittenbourg: it

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is very rare and bad. A whimsical composition, of "Jesus Christ in the Clouds," surrounded by angels, and inspiring the elector of Saxony, a half length of whom appears below; a small print, almost square.

In chiaroscuro, that is, on two blocks of wood, the one for the outline and darker shadows, and the other for the demerits and lights, Cranach has engraven "St. Christopher carrying the Infant Christ over an Arm of the Sea," a folio print, dated 1507. "St. George and the Dragon," a large 4to. "St. John preaching in the Desert," in folio, dated 1576. And, "A Naked Venus" (of ludicrous beauty) accompanied by Cupid, who is trying his bow, in folio.

The letter-press engravings of Cranach, commonly supposed to have been performed on wood, are as follow: Bull of Jean Frederic, elector of Saxony; ditto of Martin Luther in the costume of a monk of the order of St. Augustin, dated 1520; both in 4to.

Whole length portraits of Martin Luther; Philip Melancthon; the emperor Charles V.; the emperor Ferdinand; Jean Fredric, elector of Saxony; and Jean Guillaume, duke of Saxony, all of the folio size.

A half length of the elector of Saxony, holding a book open before a crucifix, a rare print, marked with the little dragon, dated in 1552, and inscribed with a Latin sentence.

Of his historical works, the following are held in most request among collectors. "Adam and Eve in Paradise, or the Sin of our First Parents," dated 1509. "The Annunciation." "St. John preaching in the Desert," which has been called a grand composition, and is dated 1516, and the "Decollation of St. John;" all of the folio size.

A set of twelve in small folio from the life and passion of Jesus Christ, inscribed on the title page "Passio D. N. Jesu Christi venustissimis imaginibus," &c. and dated 1509; this set is highly esteemed among connoisseurs. Another set of twelve, of the Martyrdoms of the Apostles, in 4to. and which are held in still more request for rich composition and the expression of the heads, and are on the whole superior to the preceding: they are dated in the year 1549.

It is curious to reflect with how frequent insensibility, the Gotho-german artists of the age of Cranach selected subjects that called for the introduction of beauty even of the highest kind, and dressed out their virgin Marias and Venuses in all the stiff meagreness of their age and country. "Paris visited by the three Goddesses on mount Ida," is a rare piece in large folio, dated 1508. "Curtius leaping into the fiery Gulph" is also in folio, and dated 1508. Three plates of tournaments, of which two are called the great, and the other the little tournament, dated 1509; and a pair of park scenes with stags in the rutting time, and which are very rare, conclude our list of the engravings of Lucas Cranach.

Hans or John Burgkmair painter, and engraver on wood, was born at Augsburg in the year 1474. He studied under Albert Durer, and some of his engravings are dated so early as 1510, but the time and place of his death are unknown. He engraved chiefly, if not entirely on wood, and his prints possess much of the fire and spirit which distinguish those of his master. Professor Christ attributes to him some small spirited wooden cuts which were made for the ancient edition of the works of Geyler de Keiserberg, which bear the above date (of 1510), and are marked I. B. Many of the works of this artist bear his name at length, the rest are marked with one or other of the two cyphers which will be found in our plate of the monograms, &c. of the German school.

The following are the engravings by Burgkmair, which are most sought after by collectors: "The Emperor Maximilian I. on Horseback;" of which design there is a dupli-

cat engraving in clare obscure, which bears the name of Jost de Negker, but which is partly the work of Burgkmair. It is a very rare print, dated in the year 1508, both of the folio size. "St. George on Horseback," also bears the name of Negker, and is of the folio size, and in clare obscure. "Joseph and the wife of Potiphar," is of a square form, and in 4to. "St. Thomas," "St. Bartholomew," and "St. Sebastian," dated 1515, are all in folio. "A young Woman mourning the loss of a Hero that Death has overcome," is a rare print in folio; by Burgkmair and Negker.

The remainder of the letter press cuts of this artist are, a set of two hundred and thirty-seven for a folio work, of which the manuscript by Marc Treitz Sauerwein is in the Imperial library at Vienna: its title is "Der weils Konig" (the wise king), and it consists of the distinguished acts of the emperor Maximilian.

"The triumphal Entry of Maximilian," consisting of one hundred and thirty-five blocks or plates, have remained for a long period of time unknown at the castle of Ambras, but within these few years have been removed to the Imperial library at Vienna, since which, impressions have been taken, and several sets have been brought to England. Many of these engravings are the work of Burgkmair, and are marked at the back with his name or initials, though the whole generally passes under the name of Albert Durer, and were probably executed under his direction. Another work, executed by these artists conjointly with Hans Schauflein, is called the Tewrdanck; but the greater number of the prints contained in it are from the graver of Burgkmair.

Johanfen, or Hans Baldung, surnamed Grien or Grun, painted and engraved for the letter press and in clare obscure. He was a native of Gemund in Suabia, and was born in the year 1476. He flourished as an engraver through the earlier part of the sixteenth century, and the latest of his works is dated in the year 1534, but the time of his death is uncertain.

His engravings are executed in a bold style, and with considerable power over the instruments of his art. Strutt says of him, that "his figures are rather expressive than correct; the naked parts of them are poorly drawn; and the extremities, though free and spirited, are often heavy, and not well marked;" yet considering the period and place at which Baldung lived, he may be regarded as a meritorious artist. His engravings are sometimes marked with his name at length, and at others with the cyphers which we have given in our plate of German monograms. His principal works are, "Adam and Eve in Paradise." "The Fall of Adam:" in the latter, a tablet is suspended from a tree, bearing the motto "Lapsus humani generis," and the date 1511. Both are of the folio size, and the Fall of Adam is a performance of merit in clare obscure.

A set of thirteen figures in small folio of the Saviour and twelve apostles, dated in 1514, and marked with the artist's cypher. "The Crucifixion," with the holy women and St. John at the foot of the Cross, in clare obscure. A set of four small uprights representing the Effects of Love, or Influence of Women, exemplified in the stories of Samson and Dalilah, Solomon's Idolatry, David and Bathsheba, and Xantippe and Socrates, (called by some Aristotle and Phryne,) dated 1515. "A drunken Bacchus lying at the mouth of a Cask," in 4to. "The Sorcerers," who is mounted on a he-goat, holding a cauldron. A pair, cut in a masterly style, of wild horses in a forest, with the name of Baldung at length, and the date 1534. Another pair of small landscapes, which are said to be etched on plates of iron, and are very rare.

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Of Hans Brefsang, a designer and engraver for the letter-press, very little more is known than that he was contemporary with Baldung, and has sometimes been mistaken for him from the similarity of their cyphers, and their taste in designing and engraving. Mistaking the numeral 5, in the dates of his engravings, for a 6, Strutt has placed him a century too late.

Those of his works which are best known, are "Adam and Eve in Paradise," of the folio size; bearing the cypher of Brefsang, and the date 1519. A set of three of the 4to. dimensions, dated 1504; viz. "Christ on the Cross;" "Christ lamented by the holy Women;" and "A dead Christ," with angels bearing him away. Another set of thirteen, of the Saviour and twelve apostles, also in small 4to. and the three Destinies in a landscape, dated 1513, a very rare print in 4to.

Lucas or Louis Krug, or Krugen, painter, goldsmith, and engraver, was born at Nuremberg in the year 1489, and died in the same city in 1535. He formed his taste, in designing and engraving, from studying the works of Lucas of Leyden, and drew the human figure better than many of his contemporaries, though his attitudes are ill chosen, and his draperies stiff. His mark was a small pot or jug placed between his initials on a tablet, as represented in our first plate of the monograms, &c. of the German engravers, to which the date was in some instances added. His principal engravings are as follow:

"The Nativity," "The Adoration of the Shepherds," and "The Adoration of the Kings," three small uprights, dated 1516. "The Holy Family," and two prints of the Ecce-Homo, with the instruments of flagellation, in small 4to. "St. John the Divine, writing," while the holy Virgin is dictating to him from the clouds, and below is the ludicrous incident of the devil emptying the ink-horn of the saint. "Two naked Women contemplating a Skull and Hour glass," and "A naked Woman sitting with her Back towards the Spectator," with a city and mountain appearing in the distance; all small uprights.

Hans Schauflein, the third engraver of that name, was born at Nuremberg some time about the year 1487, and died at Nordlingen, a town in Suabia, in 1550. He studied under Albert Durer, and imitated his style with considerable success.

The most distinguished of his performances are, "The Creation of Eve," in 4to.; "Christ with the Crown of Thorns, and the Virgin Mother in Grief;" and "Herodias with the Head of St. John the Baptist," both in folio. "The Banquet of Herodias," a grand composition, supposed to be engraven on two blocks in large folio. "Nunna Pompilius recommending religious worship to the Romans," and "Lucretia stabbing herself," a pair in 4to. A set of eight plates of military subjects in folio. Another set of four rare prints of "The Triumphs of the Wives of the celebrated Sots," in small folio. The greater number of the set of twenty of marriage processions. Part of the set of an hundred and eighteen of "The Perils and Adventures of the excellent and famous chevalier Tewedanks," a curious and very rare book, printed at Nuremberg in the year 1517.

But few libraries have the honour of possessing a complete copy of this celebrated work, of which Melchior Pfintzing says, in the dedication to Charles king of Spain, that he had seen most of the actions that are therein engraved and described, which in fact are those of the emperor Maximilian I. under the fictitious name of Tewedanks.

Albert Altdorfer, whom some have mistakenly supposed to have been of Altdorff in Switzerland, was a native of Altdorf in Bavaria, born in the year 1488. His name is found in the

register of the citizens of Ratibon in the year 1511, where, having passed the routine of preparatory civil offices, he was made a member of the interior senate, and architect of the city of Ratibon, and where, in 1538, he died without issue.

Some of his pictures may yet be seen at Ratibon, and at the town house is preserved a complete collection of his engravings. The French call him "le petit Albert," presumptively in contradistinction to the great Albert Durer, and because his engravings are small, for which reason also he is usually ranked with "the little masters."

His merit was however not inconsiderable. He engraved both for the rolling-press and letter-press; but those which he did for the latter are his best performances. He possessed a lively fancy, a free hand, and great facility of invention. Yet his style is German, and his drawing, though spirited, is incorrect. He marked his plates and blocks with the two sorts of monograms which appear in our plate of the cyphers, &c. of the German school. One of these marks has been attributed to Aldegrever; but the evident superiority of the latter master is of itself sufficient (independent of the cypher) to correct the mistake.

From the spirited wooden cuts of Altdorfer, Heibin, of whom we shall presently speak, is said, and probably with truth, to have derived great assistance in the progress of his studies.

Altdorfer's principal engravings on copper are the portrait of himself; and that of Martin Luther, in an oval, surrounded by foliage; the head of an infant, one of his earliest works, dated in 1507; "Adam and Eve in Paradise;" "Solomon's Idolatry;" "Dallah and Sampson;" "Judith and Holofernes;" several small prints of the Madonna and infant Christ; a Crucifixion, with numerous figures; another with the Virgin Mary and St. John, both small uprights; "St. Jerome standing in a Cavern," where is an altar, book, crucifix, and a tablet, with the monogram of the artist; another St. Jerome among buildings, accompanied by a lion; "St. George combating the Dragon;" two etchings of the death of Dido, and that of Lucretia; a pair copied from Marc Antonio, of "Venus accompanied by Cupid entering the Bath," and "Venus leaving the Bath;" these are small uprights and in a neat style. "Cupid Sporting with Sea-horses," "Amphion saved by Dolphins," dated 1525. A pair of "Lasciviousness," and presumptively, "Chastity," represented by a female sitting on an altar, and holding a sceptre, with numerous attendants bearing lanterns. "A Warrior precipitating himself into the Sea." A pair of small landscapes lengthways, one with rocks and the other with trees, which are touched with considerable freedom. The "Synagogue," with a Latin inscription; and two plates of ornamented vases in 4to.

The number of engravings by this master, which are supposed to have been performed on wood, is considerable, probably exceeding a hundred, of which the following are most valued:—A set of forty of "The Fall and Redemption of Man," small uprights, executed in Altdorfer's best manner, and much valued; but collectors should be careful not to admit into their portfolios, instead of these, a set of which all but two are copies from Altdorfer, and which were published at Zurich A. D. 1604, under the forged name of Albert Durer. "The Sacrifice of Abraham," and "Joshua and Caleb," both small. "The Annunciation," ditto, dated 1513.

The four following are in 4to. "The Purification;" "The Massacre of the Innocents," dated 1511; "The Decollation of St. John the Baptist," and "The Resurrection of Christ," both dated 1512, and the latter esteemed one of the most spirited works of the master.

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The beautiful virgin of Ratisbon, engraved from her statue in Ratisbon cathedral, is engraved in chiaro-scuro, though a few high-reliefs were printed without the half tint: this is a rare print.

Of the often repeated subject of St. Jerome, Altdorfer has engraved two blocks, in one of which the holy man is kneeling before a cavern in a cavern, and the other may be distinguished by its very romantic back ground, both are small, but fully held in esteem. "St. George and the Dragon," and "The Judgment of Paris," both dated in 1511, and "St. Christopher and the infant Christ," are all in 1510. A mountain scene; landscape with buildings, and a large tree on the right hand, another of a gateway, and a grand baptismal procession, a sort of allegory, where, inside of a church, the virgin and child, some angels, and a pilgrim, appear in the procession, are all of the folio size.

Hans Holbein the elder flourished towards the close of the fifteenth century, and was of Augsbourg, but afterwards removed to Basle in Switzerland. According to professor Christ, he engraved on wood, and certain prints marked with an H., or the cypher H.B., the B being joined to the first perpendicular stroke of the H., are attributed to him; but Strutt doubts whether they ought not rather to be ascribed to Burgkmair or Baldung.

The great celebrity of his son has reflected a steadier light upon his name. Hans, or John Holbein the younger, was born at Augsbourg in the year 1495 or 1498, and died of the plague in London A.D. 1554. He was the pupil of his father, and gave earnest of his very extraordinary powers, at a very early age.

About the time of his father's removal to Basle, the genius of Holbein began to dawn on the arts of Europe. At this time, beside engraving, as has been said by various authors, for the letter-press in a very superior style, he painted portraits, and occasionally historical subjects in distemper and in oil, and Erasmus, who was then superintending the printing of his works at Basle, came to sit for his likeness to young Holbein.

Being charmed with his portrait, Erasmus soon formed a friendship for the artist, and at his persuasion Holbein soon after travelled to England. He brought with him the portrait of his friend, and letters of warm recommendation to the great sir Thomas More, who was at that time lord chancellor, and high in the favour of Henry VIII.

Holbein was received by the chancellor in the most friendly and flattering manner, and the family of the Mores, besides several other persons of distinction, and finally the king himself, honoured our artist by sitting to him for their portraits. Patronized by sir Thomas, and possessed of such talent in the arts as had not appeared in England before, he was easily received into the royal service upon very liberal terms, and so proud was Henry of the abilities of his protégé, or so just to the claims of his genius, that he frequently sat to him for his portrait, and the story which we have related of the condescension of the emperor Maximilian to Albert Durer has been often repeated of king Henry and our artist.

After the death of Henry, Holbein still continued to enjoy the royal favour, and several portraits of Edward VI. from his hand are still extant.

The career of Holbein was but short, but as the poet on a less interesting occasion has beautifully said, "the sands of his hour-glass were diamond-sparks," which, as they fell, glittered in the radiance of his reputation. He died, as we have before mentioned, of the plague, in his apartments at Whitehall.

For an account of his merits as a painter the reader is referred to the article HOLBEIN. He began engraving when

he was about sixteen years of age, and very numerous and of extraordinary merit are the letter-press cuts which are said to be from his hand, and after his own designs, which adorn the books that were printed about this time at Basle, Zurich, Lyons, Leyden, and London.

Holbein appears to have formed his style, probably under the direction of his father, from studying the works of his contemporary Altdorfer, who was now rising in reputation, though not more than ten years older than our artist, and it seems highly probable that the whole of whatever letter-press engravings are from the hand of Holbein himself, are the production of those fifteen years of his life which elapsed between the years 1511 and 1526, when he came to England, for it is not very likely that he would be led aside from the advantages of the royal and noble patronage which he enjoyed in England as a painter, by any inducements which the printers and booksellers of the continent might offer. Engaged in superior pursuits, the present writer is inclined to think that he did no more than design the little wood-cuts which are ascribed to him during his residence in our island.

The foreign writers on art, however, call him "the glory of wood engraving," and "the phenomenon of his age," adding that in order duly to appreciate his merit as an engraver, the connoisseur should not look at the hastily printed and worn impressions which are common, but should have before him, early proofs, printed only on one side the paper, such as were lately in the collection of M. Otto, an amateur of Leipzig, which, in point of delicacy, exceed all that had previously been exhibited.

His most esteemed production in this way bears the Latin inscription

"Cernere vis Hospes simulaera simillima vivis?  
Hec opus Holbeinæ nobile cernere manus;"

and consists of a series of ninety small letter-press cuts, of unequal merit, of which the subjects are taken from the Old Testament. The encomiums that have been repeatedly passed on the whole, namely, that "boldness, spirit, and delicacy are united in their execution," are only applicable to the best of these cuts: the rest are scarcely, if at all, superior to the common place of the day.

The first edition of this work, which is commonly termed Holbein's Bible, is said to have been printed (at Lyons, by the brothers Melchior and Gaspar Trechsel) in the year 1539, and as this was thirteen years after his departure for England, it is not easy to believe that these cuts are really engraved by Holbein, notwithstanding what is asserted in the inscription: and they are on the whole inferior both in design and engraving to the "Dance of Death," of which we shall presently speak.

That the craft of publishers on such an occasion should have outstripped the strictness of truth, and that a name which had resounded through Europe should be used as the trumpet of popularity and the means of profit, would be no very extraordinary occurrence. The work was for the multitude, and the multitude, on such a point, were easily deceived; nor could Holbein, if he were really the author of the designs, easily contradict the complimentary inscription.

"The Dance of Peasants," engraved from a picture which he painted in the fish-market at Basle, and evidently before his departure for England, of which fine impressions are now become rare and valuable.

The cuts for "The Praise of Foily," of his friend Erasmus, have also been ascribed to Holbein, besides several detached frontispieces, jewellery ornaments, and vignettes, and, lastly, we shall mention the "Imagines Mortis," or "Dance of Death."



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Death," over Holbein's claims to which the accurate research of M. Douce of the British Museum has thrown a shade of doubt that may not easily be dispelled.

It consists of forty-six small upright prints, each surrounded by a double-line border, wherein Death, in the skeleton form, is poetically represented as leading off an individual from every station and condition of life, from the emperor in his imperial state, down to the meanest peasant; and the general moral which combines the whole is, that Death pays no regard to age, sex, or condition.

It seems proper here to be observed that these engravings are not taken, as Papiillon, Strutt, and others have mistakenly supposed, from an ancient painting on the walls of a cemetery at Basil, and that this painting is not from the hand of Holbein, but is of much older date. The originals are drawings or small pictures which have been supposed to be by Holbein, between which and the large picture in the cemetery there is this material difference, that the former forms one long and connected procession of single figures, each led by a skeleton, whereas the latter is composed of separate groups, in which one or more living figures or skeletons are occasionally introduced, as suited the views of the artist, and altogether forming a series, the idea of which was no doubt suggested by the walls of the cemetery, and by the dances of death that were sometimes found painted in the crypts of ancient cathedrals, and of which there was one at Lubec, another in the church of the Innocents at Paris, and another in our old cathedral of St. Paul.

Of Sigismund Holbein we shall say but little, for much could not be said to his credit. He was uncle to our Hans, and painted, and engraved on wood; but his powers were very inferior to those of his nephew, and even to those of his brother. The prints marked with the monogram, which will be found in our first plate of those of the German school of engraving, are ascribed to him, but Strutt doubts the fact of his having engraved them, nor does it much matter.

The cypher formed of an H and an L, which appears to that cut in the *Imagines Mortis*, of which the subject is called "The Duchess," is certainly not that of either of the Holbeins, and is very likely to have belonged to some German wood engraver, whose initials might be thus conjoined, who was the real engraver of the whole set of the *Dance of Death*, and who might perhaps be Hans Lederer, as is conjectured by Mr. Douce.

Bartolomeo Beham was born at Nuremberg some time about the year 1496, and, according to Sandrart, ended his days in Italy, a short time before the middle of the succeeding century. He travelled thither with duke William of Bavaria, and became the disciple of Marc Antonio, under whose instruction he advanced rapidly in his profession, and whose style he imitated without implicitly following. He remained several years at Rome and Bologna, working chiefly in the excellent school of Marc Antonio, and incorporating with the careful and patient manual execution of Germany, the accurate drawing of his master, and the fine taste of Italy and Raphael. Strutt accordingly says of him, that "his drawing is correct and masterly; his heads characteristic, and the other extremities of his figures well marked."

Sandrart states of this master, that in his time a great many of his engravings (presumptively engraved plates, and not impressions from them) might be seen in the gallery of the elector of Bavaria at Munich, and in the cabinet of the prince of Neubourg.

The collection of the works of Bartolomeo Beham is however attended with considerable uncertainty, from the circumstance of many of them having been published with-

out his name, monogram, or other mark. Strutt attributes to him the engravings that are marked with a small die, on which sometimes appears the letter B, whilst the abbé Marolles, Huber and Rossi, contend that these prints are the production of Beatrice.

Of the works generally attributed to this master the following are the principal:—the portraits of William, duke of Bavaria; Erasmus Balderman, at the age of 33, and Leonard van Eck, a counsellor of Bavaria, all in octavo. The emperor Charles V., at the age of 31, with the Latin inscription "Progenies divum quintus sic Carolus ille imperii Cæsar et ora tulit;" and the emperor Ferdinand I. with the inscription "Proximus a fummo Ferdinandus Cæsar Rex Romanorum sic tulit ora genas," both in quarto, and marked B.B. These are a finely engraved pair of portraits, and so much in the style of Marc Antonio, that Vasari thinks the portrait of Charles V. is really engraved by that master.

The best historical works of Beham are "Adam and Eve, with the figure of Death introduced into Paradise;" "Judith beheading Holofernes," dated 1525, and in the taste of Marc Antonio. "The Madonna suckling the Infant Christ at a Window," (without the mark of the artist.) "A Sybil reading, and having before her a Boy holding a Flambeau," (marked B. B. but apparently after Raphael.) "Sufannah and the Elders," after Julio Romano. The deaths of Lucretia and Cleopatra, both without the engraver's mark. "The Judgment of Paris," with a dark background, a small frieze, representing a combat, and marked "Titus Gracchus," and another small plate of a combat, wherein soldiers are fighting with clubs, companion to the above. "An Infant caressing a Dog," a small circle, dated 1525. Another Child, with a skull near him, marked B. B. and dated 1524. An emblematical piece, inscribed "Der Weif Lauf," in which appears a half naked woman fettered, and asleep under a tree, an infant at her side, and a lamb at her feet; and an indelicate subject from Ecclesiastes.

Hans Sebald Beham, the cousin or nephew of Bartholomew, was born at Nuremberg in the year 1500, and died at Frankfort on the Maine in 1550. He is said by Sandrart to have studied under his relative, but Bartholomew went early to Rome, and, it must be remembered, was but four years older than Sebald; perhaps he merely learned of him the rudiments, and afterwards studied with Aldegrever, of whom we shall presently speak, the works of Albert Durer.

He was obliged to quit Nuremberg on account of his libertinism, but settled soon after at Frankfort; where, however, he relapsed into his former courses, and after engraving for some years, in the course of which the number of plates and tablets which he produced is surprising, he became the landlord of a tavern.

The German biographers of Sebald maintain, that when he established himself at Frankfort, he altered his monogram, by substituting the letter B for the P which he used at Nuremberg; they do not say he did it for the sake of concealment, and it may in some degree account for this variation, when we recollect that these letters are often orally confounded among the people of that nation. The Abbé Marolles, Le Comte, and the French writers, on the other hand, often call him Hübens, and Sebald de Bohémé, for which we cannot so readily account.

Sebald Beham ranks deservedly high among the little masters; he engraved chiefly from his own compositions, which saw a lively and vigorous invention, though somewhat hampered by the Gothic-german taste, which was then prevalent, and which chiefly appears in the starched and inelegant folds with which he loaded his draperies. His drawing of the naked, on which he seems to have justly prided himself, though not free from manner, is often

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correct, and sometimes masterly; his heads are expressive, and his other extremities carefully determined. The manual part of his engraving on copper, executed with the graver only, is clear and delicate. The prints which he has cut on wood are slight, but spirited and free, as wood engraving ought to be; for wood engraving ought not to emulate the delicacies and difficulties of the art of engraving on copper.

His two monograms will be found among those of the first plate of the German school. From those which he engraved between the years 1549 and 1530, with the Nuremberg cypher, we select the following; viz. the portraits of Sebald Beham and his wife Anne, where his cypher appears encircled by laurel. Two small plates of "Adam and Eve in the terrestrial Paradise," dated 1519. "St. Jerome with his Lion holding the cardinal's Hat." "The Madonna suckling the infant Christ." "The Virgin of Ratisbon," where she is represented standing on a crescent, and surrounded by radiance, and "The Death of Dido," all dated in 1520. "St. Anthony writing in the Desert," and "St. Sebald, (the patron saint of Nuremberg,) sitting among trunks of Trees, and holding in his right hand the Model of his Church," both dated 1521. "Two Peasants marching and playing on the Flute and Bag-pipes, and a male and female Peasant Dancing," dated 1522. "A Triton supporting a Nereid," dated 1523. "Force, allegorized by a Woman sitting on a Lion," dated 1524. "A young Man sitting under an Arbour embracing a young Woman," dated 1526. "The Death of Cleopatra," dated 1529. An ornamented vase with an inscription. "A combat between the Greeks and Trojans," inscribed "Krichen und Droener," and another combat, inscribed "Achilles und Hector," both small friezes.

Of those which S. Beham engraved at Frankfort, between the years 1531 and 1549, and which are marked with his second cypher, the following are held in most esteem.

A vase enriched with sculptured ornaments, at the base of which are two sirens, dated 1531. "Adam and Eve caressing each other." "Adam and Eve in Paradise," between whom is Death, with a serpent wound round him, presenting the fatal apple; a high finished plate, dated 1543. "The emperor Trajan arrested at the head of his Army." "Melancholy and Patience," two female figures, the former copied from the celebrated engraving of the same subject by Albert Durer, dated 1539; the latter sitting on a column, which is inscribed "Patientia," and dated 1540. Another pair, of Good-fortune and Evil-fortune, the former figure standing and holding a wheel, the latter arrested in her course by an evil genius, who is presenting her with a lobster or craw-fish. An etching of a buffoon presenting flowers to a young woman. A set of the four evangelists, dated 1541. Another set of twelve of the labours of Hercules, dated from 1542 to 1548. "An Ensign beating a Drum," inscribed "Im Bauern Kreig;" small, and dated 1525. "A Roman Charity," very finely engraven, dated 1544. The arms of Beham, as granted to the family by the emperor Maximilian, a hexagonal print, inscribed "Sebald Beham, von Nurnberg, maler, jekt wohnhafter Burger in Frankfurt," dated 1544. Bust of Domitian in the manner of an antique medal. A set of six, and a title-page of the months represented by male and female peasants dancing, the last dated 1545. "The Judgment of Paris," dated 1546. "Death seized from behind by a naked Female," a beautifully finished plate, dated 1547, with the following words inscribed on a stone, "Omnia in homine venustam mors abolit." "A Man endeavouring to root up a Tree," dated 1549, and inscribed "Impossibile, &c." and a virgin and child copied from Bartholemew Beham, dated 1549.

The letter-presses of S. Beham have not been thus carefully arranged and separated. We select from them the following.

His own portrait in a bonnet and without a beard. A set of eight from the Passion of our Lord, two of which are marked with his former, and two with his latter cypher. An "Holy Family," in which St. Joseph is plucking fruit. "The Virgin and Child." "A Penitent." "St. Jerome with a Bible and Crucifix." "Immortality," represented by a female crowned with stars, and trampling on a skeleton, dated 1548. A public bath of Anabaptists, of both sexes and all ages, of the circular form. Another public bath, a large print on four leaves. "A village Fair" of the frieze form, and "A March of Soldiers," also of the frieze form, and large; the four last-mentioned engravings are very rare; a set of three hundred and forty-eight, engraved for "Biblicæ Historiæ Artificiose depictæ," printed at Frankfort in 1537. But it is to be observed that there are two editions of this bible, of which the former is in Latin, and the latter, dated 1539, is in the German language.

Gregory Peins, or George Pentz, was also a native of Nuremberg, born in the year 1500. He first studied in the school of Albert Durer, and profited much by the instructions of that distinguished master, but it was in Italy, and under Marc Antonio, that he finished his taste, formed his style of engraving, and acquired that correctness of drawing which we regard with so much admiration in his best works. His plates are executed entirely with the graver, which he handled with much skill, uniting with great precision a degree of freedom which was unexampled. He appears to have worked on some of the best plates that pass under the name of Marc Antonio.

The far greater number of the engravings of Peins are of small dimensions; wherefore he is usually classed among "the little masters;" but he has produced some few large prints; one especially of great merit, of "An Army passing a Ditch, and scaling the Walls of a fortified City," after Julio Romano; which, as Strutt has said, is "an admirable specimen of the artist's superior abilities."

Peins died at the age of fifty-six, but where, his biographers have not mentioned; his monogram will be found in our plate of those of the German school; and the most esteemed of his numerous works are those which follow: Portraits of Gregory Peins and his wife on the same plate, with the inscription "Imago Gregori Peins Imago Duxore Gregori Peins." From this engraving it should appear, that the name it bears was the true name of our artist, and that the name Georgius Pentz, which appears under his large plate after Julio Romano, is probably an error of the publisher Van Aelst. Portrait of Jean Frederic, elector of Saxony, a rare print, dated 1543.

The best of the historical works of Peins are, a pair of "Ester before Ahasuerus," and "The Temptation of Job;" another small pair of "Judith in the Tent of Holofernes, and Judith appearing afterwards with his Head;" another pair, finely executed, of "Solomon's Idolatry," and "The Judgment of Solomon."

Peins appears to have possessed some judgment, at least some humour, in pairing his prints; the next companions which we have to notice, are "Sufannah solicited by the Two old Men," and "Lot intoxicated by the Two young Women, his Daughters."

From the history of the patriarch Joseph, we find a set consisting of four plates; another set from the history of Tobit of seven, including the title-page. A pair of "The Good Samaritan, and the Conversion of St. Paul." A set of the Four Evangelists after Aldegrever, which bear the cyphers of both artists. Another set of the Seven Works of Mercy, of the circular form, and with German inscriptions. Another set, very highly finished, consisting of twenty-five, from the Life of Christ. "Herodias receiving the

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the Head of John the Baptist." A pair of "The Rape, and Death, of Lucretia." A pair of "King Porfenna passing the Tiber, and Horatius Cocles singly defending the Bridge." Another pair from the Life of Virgil. Another pair, dated 1539, of "Cephalus and Procris, and Medea and Jason." "The Death of Dido," and "The Death of Virginia." A set of three, of "Mutius Scevola thrusting his Hand into the Fire;" "Marcus Curtius precipitating himself into the fiery Gulf;" and "The Punishment of Titus Manlius;" in the latter of which the artist has introduced the beheading machine, which is since known in France, the dreadful guillotine. A pair of "Sophonisba" and "Artemisa;" "The Supplication of Regulus;" "The Centaur Chiron instructing Achilles;" "The Triumph of Bacchus," a frieze in the antique taste. A set of six emblematical triumphs of human nature, *viz.* of Valour, Chastity, Love, Time, Death, and Religion. A set of five of the senses personified, with Latin inscriptions; another set of the seven liberal arts; and another of the seven mortal sins.

But his principal and largest work, of which we have already spoken, is "The taking of Carthage by the Romans," after Julio Romano.

Among that class of the ancient engravers of the continent who are called the "Little Masters," from the small dimensions of their works, Henry Aldegrever stands in the very first rank. He was born at Zoult in Westphalia, A. D. 1502, but of his ancestors we find no account. Both his baptismal and family names have been mistaken, for, by some authors, he is called Aldergraft; while others, perhaps, mistaking some of the smaller works of Albert Altdorfer for his, say that his christian name was Albert; but professor Christ assures his readers that the name of this artist was Henry, and not Albert; and upon his own portrait his surname is written, at full length, "Aldegrever."

Nuremberg was at that time the head-quarters of German art; and thither young Aldegrever was sent to study under Albert Durer. He imitated the style of his master with great success, and gradually learned to blend with it a certain small portion of the elegance and simplicity which Italy first caught from the resurrection of Grecian art; and Germany from the engravings which were brought thither from Italy.

Aldegrever is a lofty object, which receives the first faint rays of a rising sun, and it is universally allowed by his critics, that had he resided in Italy, "the genius and ability which displayed itself so conspicuously in his own country, would have shone with double lustre."

The manual part of his engraving, executed entirely with the graver, is extremely neat, and in a style evidently founded upon that of Durer. He is among the first who gave texture to the light parts of flesh by the admixture of small long dots, which has since been carried to such admirable perfection by Nanteuil and others. His drawing of the naked, which he seems fond of introducing, is more correct than is found among his predecessors of Germany, and his men more correct than his women. His heads are, in general, expressive, and his other extremities well marked, though occasionally somewhat heavy.

The time of the decease of Aldegrever is not accurately known, but the latest of his prints is dated in the year 1558. The Abbé Marolles had seen at least three hundred and fifty different prints from his graver, of which the following list contains the names of the principal; but the great demand for his works has occasioned his plates to be much worn, and often re-touched; and Strutt, with becoming solicitude for his fame, advises the collector to be circumpect as to the impressions he admits into his port-folios. His monograms may be seen in our plates of those of the German school.

The principal portraits of Aldegrever, are those of himself without a beard, aged 28, and dated 1530. Another of himself, aged 35, in which he appears with a long beard; Martin Luther, dated 1540; Philip Melancthon, of the same date; and Albert Vander Helle, aged 28, and dated 1538; all in quarto.

His folio portraits are those of William duc de Julius; John of Leyden, king of the Anabaptists, and Bernard Knipperdolling, another fanatic.

Of his historical engravings, the most celebrated are, A set of six, from the History of Adam and Eve, dated 1540. A set of four, from the History of Lot, dated 1555. A set of four, from the History of the patriarch Joseph, dated 1528 and 1532; all in 12mo.

A set of six, from the History of Absalom, dated 1540. A pair of "David and Bathsheba;" and "The Judgment of Solomon," in 8vo. A set of four, of "The History of Susanna and the Elders," dated 1555. Another set of four of "The Good Samaritan." A set of five, from "The Parable of the Rich Man," dated 1554. A set of the "Four Evangelists," bearing the monograms of both Aldegrever and Peins. "The Annunciation and Nativity," a pair, in 8vo. Two of "The Madonna and Infant Jesus." Two small friezes of "Battles between Hector and the Greeks, and Scipio and the Carthaginians." A set of six, of "The Deities who preside over the Planets." A set of twelve, of "The Labours of Hercules," each with a Latin distich, dated 1550. A set of fourteen allegorical figures, ending with the Saviour victorious, and inscribed "Pax nostra Christus." A set of the seven Cardinal Virtues. A set of the seven worst Vices. Another set of seven, of "The Empire of Death," dated 1541.

The only etching from the hand of Aldegrever is now become very scarce; its subject is Orpheus and Euridice, dated in 1528, and in 12mo.

James, or Jacob Binck, was also of Nuremberg, or, according to some authors, was born at Cologne, in the year 1504, and died at Rome in 1560. His style of engraving greatly resembles that of Aldegrever, under whom, or Albert Durer, he probably learned the rudiments of his art, and improved himself afterward in the school of Marc Antonio: yet his style is not always the same; it often possesses more seeming facility than that of Aldegrever, and when, at the best, more of Italian taste. He apparently studied also, and imitated, that of Marc de Ravenna.

His cypher, composed of the initial letters of his name, is that of many other artists who lived about the same period; but he sometimes added a little bird, and at others used the monogram, which will be found on our second plate.

The chief works of Jacob Binck are, "A young Man dressed in a Bonnet, holding a Skull under his Cloak, and a Cup in his Right-Hand." This, according to Sandrart, is his own portrait; but, though the face may possibly resemble him, the rest of the composition is copied from an engraving of the same size by Israel von Mechenin.

The portraits of Francis I., Christianus II. surrounded by ornamental architecture; a young princess, dated 1526; Luke Gassele, dated 1529; the archduchess Elizabeth of Denmark; a pair, of Martin Luther, inscribed "In silentio Vestra," and Philip Melancthon, inscribed "Si Deus pro nobis quis contra nos."

His principal historical engravings are, a small plate of St. Jerome. "Marcus Curtius precipitating himself into the Fiery Gulf," marked 15 I. B. 29. A pair, of the frieze proportions, of "Infant Bacchanals gathering grapes, &c." and "The Triumph of Bacchus," wherein his car is drawn by satyrs, and attendant nymphs are playing on

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musical instruments, dated 1528, 1529. A set of the Seven Planets personified. Another of the Seven Cardinal Virtues. An emblematical piece en medallion, in which a flaming heart, *i. e.* an heart of ardent virtue, is beaten on an anvil, by four allegorical females: which figures, as we are informed in Bildbald Pirkheimer's emblems, are Experience, Envy, Tribulation, and Intolerance, marked 15 I. B. 29. "History," a female figure with wings, writing. A pair of "Peasants marketing with People of superior Condition." A set of twenty, of Divinities standing in Niches, copied from Curialices, who copied them from Rosso.

The above are marked with the initials of the artist: the following are with his monogram. A pair, very small, of "Eve with Two Apples, and Adam holding the Branch of a Tree." "Lot and his Daughters," a small circle. "David with the Head of Goliath;" and "Judith with that of Holofernes;" both small. "The Millennium, or Archangel Michael, chaining the Devil." "The Holy Family." "The Slaughter of the Innocents," a very rare print, after Raphael, but perhaps copied from the engraving by Marc Antonio. "The Descent from the Cross." "St. John asleep with the Lamb," dated 1526. "St. George and the Dragon." "Mercury travelling in a Defart," a small circle. "A Soldier defending himself against Death, who has overthrown him." "A Woman beating the Devil with a Distaff." "A Woman advancing with Surprise towards a Man who is seated near a Pedestal, on which is a Child," after Raphael, and engraved under the direction of Marc Antonio. "A Male and Female Peasant Dancing." "The Blind Child." A vignette, with Cupids mounted on dolphins.

Strutt begs leave to add, a figure of "Saturn standing in a Niche devouring One of his Children," a small upright, which differs in the style of engraving from the foregoing, being more bold, spirited, and correct. The real meaning of this allegory must be, that Time is swallowed up by Eternity. On a tablet which is introduced is "Jacobus Binck Colonienfis, fecit 1530.

Another of "the little masters" of Germany was Hans or John Brosamer, born at Fulda, in the circle of the Upper Rhine, in the year 1506. His manner of engraving often bears resemblance to that of Aldegrever, but the school in which he studied is not known; sometimes, however, he differs from that distinguished master by interworking the lines of his draperies and backgrounds with slipping. His drawing of the naked is however very deficient, and in manual execution he by no means equalled the Behams. He died at the age of fifty-four, and his cypher, composed of the letters H and B, will be found in our first plate of those of the German school.

His principal engravings are, the portraits of Martin Luther, and the abbot of Fulda, dated in 1541.

And in history, "Samson and Dalilah;" "David and Bathsheba;" and "Solomon's Idolatry;" dated 1543, all small uprights. "Xantippe and Socrates;" "Laocoon and his sons;" dated 1538; "The Rape of Helen;" of the frieze form, dated 1540; "Marcus Curtius leaping into the Gulf;" a small circular plate; "The Judgment of Paris;" "A Crucifixion, with Angels, the Virgin Mary, and St. John;" "The grand procession of Christian Heroes;" a rare print, engraved on wood, and sometimes attributed to Burgmaier; and "Biblia Veteris Testamenti artificiosis picturis effigata," printed at Frankfort in the year 1552, and consisting of a set of engravings on wood, chiefly, but not entirely, copied from those of Holbein, which were published at Leyden in 1547; but by no means equal to the originals, either in spirit, neatness, or truth.

Augustin Hirschvogel was born at Nuremberg A. D. 1526, and died in the same city in 1560. He was probably educated a painter, but produced several etchings, of which the landscapes possess considerable merit, being etched with some taste and the touch of a master, but when he introduced the human figure it is very incorrectly drawn. The singular monogram of Hirschvogel, surmounted by a little cross, will be found in our first plate of those of the German school, and his principal productions are as follow:

Part of "Raphael's slaughter of the Innocents," from a sketch by that master, which differs from the print by Marc Antonio, dated 1545. A set of four, and another set of six landscapes, from his own compositions of castle and mountain scenery, in 4to., dated 1546. A folio landscape, in which is introduced an ill-drawn female intended for Cleopatra, dated 1547. An ornamented vase in 4to. dated the same year, and two small views of sea-ports, with shipping, &c. dated 1549.

Henry, whom Strutt has mistakenly confounded with Hans or John Lautensack, was also of Nuremberg, or, according to some authors, was of Doppelmayr, and born in the same year with the preceding artist. He was the son of a painter, and learned the principles of design in his father's house, which he probably continued to inhabit, for we find that he died in his native city in the year 1590.

The elder Lautensack employed much of his time in engraving on the precious metals for the sideboards and personal ornaments of the opulent and the great, but in the year 1567 he published at Frankfort on the Mayne the "Geometrical proportions and perspective of the Man and Horse;" in small folio; "The Martyrdom of St. Catherine;" two ornamental plates of boys, &c.; "The decollation of St. John the Baptist;" "Christ expiring on the Cross," and a boy standing on a globe with a bow in his hand, and below whom is a deluge, with many small figures, are also engraved by Henry Lautensack, whose marks will be found in our second plate of German monograms.

Of the same place and family with the preceding, was Hans Sebald Lautensack, who was born in the year 1508, but of the principal events of whose life, and the time of whose death, we are ignorant.

His portraits are held in esteem among connoisseurs for their truth of resemblance; and his landscapes, which are chiefly etchings, for their wild, or beautiful, or grand effects; but the figures which he has introduced are generally disproportioned.

His landscapes are of an historical character, and are commonly denominated after the figures they contain. Of these the following will probably be found most worthy of the collector's attention: "The little David combating the Great Goliath," dated 1551. "The Blind Man of Jericho, restored by our Saviour," and another miracle of "The Devil cast out from the Canaanite," both dated 1559. "Balaam and his Ass," in a very mountainous landscape, and a very rich scene of "The Labours of the Vintage," are also dated in 1559, all of the folio size. An upright landscape with a large farm, dated 1551. A pair of interesting and extensive scenes in 4to. dated 1553 and 1555. A grand tournament, of large folio dimensions, entitled "Equellris pedestrique pugnaeicon," 1560; and another grand joust, entitled "Secundum Circulum Ludorum, equestre certamen continens," 1560, both of which are now become very rare. A pair of views of the imperial city of Nuremberg, in large folio, each engraved on three plates, and dated 1552 and 1555.

The principal portraits by Hans Sebald, are those of his father Paul Lautensack, painter of Nuremberg, in folio. Himself, in small folio, dated 1552. Hieronimus Scurftab. Georgius

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Georgius Roggenbach, and two other half-lengths, all in folio.

The brothers David, Jerome, and Lambert Hopper appear to have been the sons of a goldsmith, and flourished at Nuremberg within the first fifty years of the sixteenth century. They produced a great many spirited etchings, which Hollar afterwards made the foundation of his style. David was the most industrious of the three, but deficient in the vicious taste of his age and country: yet his freedom of handling is very pleasing, and displays itself to advantage in buildings and ornaments. He usually marked his plates with the initials of his name, between which he introduced what the Abbé Marolles appears to have mistaken for a candlestick, for he emphatically calls the Hoppers "le Maitres du Chandelier," but what is really intended for a hop-plant, in allusion to their name, which in the German language signifies hop-plant. These letters, with the plant, sometimes appear on a tablet, for which see our plate of German monograms.

The principal works of David, are the portraits of Nero and Galba, of the 4to size, as medallions. Carolus Rex Catholicus, the same. Martin Luther, dated 1523, and Claude Sturzenbecher, a rare print in folio.

Of his historical engravings, we shall mention, "David beheading Goliath," in 4to and "David Playing on the Harp before Saul," in folio, dated 1531. "The Adulterous Woman;" "The Presentation in the Temple;" "The Last Judgment;" and "A Grand Altar," with the figures of Jesus Christ, the Virgin Mary, St. John the Baptist, and others, all in folio. A sort of ridiculous "Morice Dance of Grotesque Figures." "The Monopoliser of Grain, execrated by the People," inscribed, "die Sprich Salomo. Das XI. Capitel." A subject from the 10th chapter of Solomon's Proverbs, dated 1534, both in folio. "The Three Great Jews, Joshua, David, and Judas Maccabeus, on horseback." "The Three Christian Heroes, Charlemagne, king Arthur, and Godfrey of Brulloigne," companion to the above, both in 4to. and after Hans Burgmaier. "A Grand Village," of square form and folio dimensions. "Two Females Surveying themselves in a Mirror, behind whom are Death and the Devil." Two very grotesque figures, inscribed "Bolikana, Markelfas," in folio. "The Crucifixion betwixt the two Thieves." Another "Crucifixion," in which St. John and the Virgin Mary are introduced, the latter pierced by a sword, in allusion to her excessive grief; and a small copy of a celebrated work of Andrea Mantegna, of "A Combat of Marine Monsters."

Jerome Hopper etched much in the same style with his brother, but was somewhat his inferior in merit. He made several copies from celebrated works of Albert Durer, and sometimes engraved from his own compositions, marking his prints as did his brother.

His best works after Durer are, "St. Hubert," "St. Jerome," and "The Grand Cannon." "Hercules Combating the Hydra," is from Andrea Mantegna: and the best from his own designs are "Lucina holding a Moon in her right Hand, and a Flanbean in her left." "Minerva holding a small Figure of Victory." A rare print of "The English and French drawn up in battle array, previous to the Fight at Agincourt." And a battle, after Julio Romano.

Of still less merit than his brethren, was Lambert Hopper, who copied in etching a great number of the wood cuts of Durer, but his works display little taste and less correctness.

Among them are a set of fifteen of "The Life and Passion of Christ." "The Conversion of St. Paul." "The Fall of our First Parents." Several plates of arabesque ornaments,

and four beautiful candelabra, with an arabesque band which is esteemed the best of his engravings.

Strutt has added to these another Hopper, for whom he claims equal merit with the best. The initial letter of his christian name was an N. He worked with the graver, but imparted to his lines somewhat of the roughness of etching, and drew more correctly than David or any other of the family. To this artill he ascribes "The Call of Jeremiah," a small upright, dated 1525. "A female Saint, holding a Palm Branch, and several Figures sleeping with the Deity appearing above," which, he says, is "a fine spirited etching."

David Funck, a printfeller of Nuremberg, towards the beginning of the last century, collected and published all the plates of these artills, amounting to two hundred and thirty, under the title of "Opera Hopperiana:" some of which were found to be executed on plates of iron or tin.

Virgile Solis engraved both on copper and on wood, chiefly from his own designs; was born at Nuremberg in the year 1514, and died in the same city in 1570. Under what master he studied does not appear. His early works resemble those of Beham, but when he came to engrave after Raphael, and other Italian masters, he adopted a style more open and spirited. His prints on wood bear great resemblance to those of Jost Ammon, both in design and execution.

Virgile Solis was a man of ability. His compositions are often judicious, but his drawing of the naked is not equally correct. He is classed among the little masters, and used occasionally three cyphers, which will be found in our second plate of the monograms of the German engravers.

Mr. Evelyn says, that for "imitating the vile postures of Aretin, he had his eyes put out by the sentence of the magistrate." Strutt presumes, that if this story be true, the engravings of Solis must have been copies from those which Marc Antonio did after the design of Julio Romano, (and which had nearly cost him his life,) to which the poet Aretin did but supply verses.

The engravings of Solis amount to upwards of eight hundred, of which it may suffice to specify the following: "The Marriage of Cupid and Psyche;" "The Assembly of the Gods;" and "Mount Parnassus," all after Raphael. "The Birth of the Anabaptists," a small plate, after Aldegrever. A set of four plates of fragments of ancient architecture. A set of six heads of Roman emperors, small. A pair of small friezes, in which are numerous parroquets. A set of portraits of the kings of France, from Pharamond to Henry III. The above are on copper, with some few etchings, which are inferior to the rest of his works.

His principal engravings on wood, are a set of one hundred and seventy from Ovid's Metamorphoses, small, and dated 1563. A set for the emblems of Nicolas Reusner, dated 1581. And, another set for those of Andrea Anciatius, both of which books were printed at Frankfort in the year 1581.

Melchior Lorch, or Lorch, was born at Flensburg, in the dutchy of Sleswic, in the year 1527, and died at Rome in 1586. He was distinguished both as an artill and an antiquary: some time about the middle period of his life, he made a voyage to Constantinople, where he painted and engraved the portraits of the grand seignior and his favourite, which are now become very rare, and where he formed that collection of Turkish dresses, which were afterwards engraved on wood, and published in the year 1576, in a folio volume. His engravings are decidedly those of a man of talent: he drew with considerable spirit, and a tolerable degree of correctness. His works on wood are executed with much freedom and boldness, while in those on copper these qualities



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qualities are in some degree lost in the neatness to which he laboured his finishing. Strutt speaks of a crucified figure, (which is designed so much in the style of Michael Angelo, that he supposes it to be engraven after some work of that great master) as a very extraordinary production. It is executed entirely with the graver, and the left leg and arms are much fore-shortened. He says, "if this figure be not quite correct in all its parts, it is however well drawn upon the whole, notwithstanding the difficulty of the fore-shortenings, and is finished in a style of neatness equal to that of Jerome or Anthony Wierix, while it is superior to them in point of taste." His monograms, which he sometimes surmounted by the date of his work, will be found in our second plate of those of the German school.

The works of Lorich, which are held in most request among connoisseurs, are: the portrait of Martin Luther, dated 1548. That of Albert Durer, with four Latin verses, dated 1550, a very rare print, done in imitation of a Cameo, and those which we have mentioned above of the grand seignior and his favourite sultana, very neatly executed on copper, and very scarce. Aristotle, the Stagyrice, dated 1561. "St. Jerome in the Desert," dated 1546; and a small upright of a female head, beautifully executed, are also on copper.

His best engravings on wood, are a set mentioned above, of the costume of Turkey, in small folio, dated from 1570 to 1581. "The Tiburtine Sybil," dated 1571, executed in his best style. "A Woman pressing her Breast, with numerous Animals below," and inscribed "Ops Saturni conjux materque Deorum," a very spirited engraving in folio, dated 1565. And "The Deluge," a large folio, engraven on two blocks, the impressions from which are afterward pasted together.

Theodore de Bry, or de Brie, the elder, was born at Liege in the year 1528, and died at Frankfort on the Maine in 1598; at which latter place he chiefly resided, but to whom he owed his early initiation to art is not known. He appears to have formed his taste by copying the works of Sebald Beham. He worked almost entirely with the graver, and acquired a neat and free style, which was well adapted to small subjects, in which numerous figures were required to be introduced, such as state, and funeral, processions. He drew correctly: his heads in general are spirited and expressive, and his other extremities well marked, and his back grounds, though frequently slight, are touched with a masterly hand.

About twenty years before his death he visited England, and engraved at least two large and laborious plates, of which we shall presently speak, in the city of London. He died, as his sons in the 3d part of Boissard's collection of portraits inform us, March 27, 1598. De Brie marked his plates with the cypher T. B. F., and at other times with that of Rene Boivin; and his principal engravings are those which follow: an etching of "St. John in the Desert," a rare print. A pair of "The Fountain of Youth," and the "Little Village Fair," copied from Sebald Beham. "A Bacchanalian Procession," from Julio Romano. Three mixtures of the grotesque with the allegorical, of the circular form. "The Golden Age," a small circle, after Abraham Bloemart. A pair of portraits en medallion, of Scanderbeg and Donice his wife. A set of nine figures of the muses, in folio. The plates for the four first volumes of Boissard's Roman Antiquities (of which the two last volumes were completed by the sons of our artist). The plates of the manners and customs of the Virginians, published in "The brief true Report of the New-foundland of Virginia, by Thomas Harriet, servant to Sir Walter Raleigh," from

drawings by J. White, printed at Frankfort by J. Wechelius, A. D. 1590, which were afterwards copied by Picart, for his "Religious Ceremonies, &c." The plates to the Latin narrative of Spanish cruelties in America, published 1598.

His largest work appeared in the same year, and is entitled "Descriptio Indiae Orientalis et Occidentalis," in nineteen tracts, which are contained in five folio volumes.

De Brie is also the author of a work which may be thought still more interesting to British feelings, because connected with British history. It is the procession of the knights of the garter in the 18th year of the reign of Elizabeth, of which Strutt gives a very particular description: "The procession is represented as moving along a portico quite open on the side next the observer, but supported by thirty-three pillars of the Ionic order, on the side from him. Over each knight companion of the order, are his arms within the garter, and, in a compartment below, his name, titles, &c. are written in French. The last stall was vacant, and there is only a fancy portrait given, without name or arms. There are sixty portraits in the procession, each of them between four and five inches in height! Under the arches of the portico is a delightful view of a hilly country, (too hilly for an English prospect,) interspersed with castles, churches, houses, rivers, woods, &c. and an exact view of Windsor castle as it appeared in that reign. The roll is sixteen feet three inches long, and was engraved on twelve plates."

Hollar to his plate of the procession, copied in small from this engraving, in Ashmole's order of the garter, says, "the original was designed by Marc Garrard, who could be then only fifteen years old." Wherefore Strutt concludes this to be a mistake, but perhaps Garrard made a reduced copy from this print, from which copy Hollar's plate was engraven, which would reconcile the accounts; for lord Orford dates Garrard's drawing in the year 1584, whereas De Brie's plate was finished in the year 1578; and Strutt, reasoning from the dedication being made in the name of Thomas Dawes, Rouge-Croix, concludes that it was designed by him.

Strutt says he never heard of any other impressions from this plate than the proof, which, after belonging to the Norroy king at arms, came finally into the possession of John Fenn, esq. of East Durham in the county of Norfolk; but the engraving is mentioned by Huber, and presumptively therefore, is not unknown on the continent.

To this detailed account of this very curious historical engraving, Strutt adds the order of procession, and the names of the sixty portraits of the knights companions and officers of state; and the reader who wishes to be informed on these points, is therefore referred to his biographical dictionary.

The other plate which our artist is known to have engraved in London, is "The Funeral Procession of sir Philip Sydney," on thirty-four plates, forming, when pasted together, a very long roll, but more frequently forming a book. In the inscription beneath, it is said to be "contrived and invented by Thomas Lant, gent. servant of the honourable knight, and graven on copper by Derick, or Theodore de Brie, in the city of London 1578;" and prefixed is the portrait of Mr. Lant, aged 32.

Jean Theodore de Brie the younger was the eldest son of Theodore, of whom we have just concluded our account. He was born at Liege in the year 1561, and died at Frankfort on the Maine in 1623.

The engravings of Jean Theodore are on the whole superior to those of his father both in taste and precision, and he assisted his father in the literary parts of those works in which



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which he engaged, as well as in the engravings; but Jean Israel, the second son of Theodore, who also assisted, and succeeded him, was far less successful.

The brothers John, Theodore, and Israel, completed the plates for Boissard's Roman Antiquities, and added several to the collection of portraits of illustrious persons, which their father had begun to form.

Among other portraits, we find those of Gerard Mercator the celebrated geographer, and Daniel Specklin, both in 4to.

The best historical works of Jean Theodore are, a set of the elements, consisting of four plates in 4to. "The Return of Rebecca," after Balthasar Peruzzi. "A March of Soldiers," and "A March of Soldiers conducting Prisoners," sometimes called "The Triumph of Death," both of the frieze form, and by some supposed to be after Titian. "The Village Fete," with a Latin inscription, after Sebald Beham, and "The Fountain of Youth," after the same, both of the frieze form; and a set of seventy-four plates for "Proscenium vitæ humanæ sive Emblematum, &c." accompanied with explanations.

Jean Kelertaler was born at Dresden in the year 1530; under whom he studied is not known, but he continued engraving in his native city, until some time about the close of the sixteenth century. He engraved some plates after Jean Marie Nossen, who was sculptor and architect to the elector of Saxony, of which the following are those of most importance.

"Nimrod building the Tower of Babel;" "The Destruction of the Babylonian Empire;" "The Empire of Rome," in the back ground of which is the death of Cæsar. "The Empire of the Church," where the Pope is represented receiving the homage of Charlemaigne; and "An Allegory," where a winged figure of Death, with two trumpets, is supporting a globe, all of the 4to. size.

Tobias Stimmer was born at Schaffhausen towards the close of the sixteenth century, but resided chiefly at Strasburg, where he was patronized by the margrave of Baden, and became both a painter and engraver of eminence. His engravings are chiefly on wood, and from his own compositions; the engravings in the "Novæ Tobias Stimmeri sacrorum Bibliorum figuræ versibus Latinis et Germanicis expositæ," are from compositions by Stimmer, though he was assisted in the engraving by his brother Christopher, and his pupil Christopher Maurer. Stimmer understood the human figure very well, and composed with so much taste and judgment, that Rubens has been heard to declare, that he had studied Stimmer's bible with attention and with great benefit, and Sandrart, who relates this anecdote, calls the book, "A Treasury of Science for the art of Painting."

In the earlier part of his career, Stimmer was unfortunate, and passed some of his best days in painting the façades of houses at Frankfort on the Maine, and at Strasburg. But let no man of talent, who possesses the means of showing his talent, despair; it was the pleasure he received from some of these, which accidentally caught his notice, that occasioned the margrave to engage Stimmer in his service, and became the foundation of his fortune. For him our artist painted the history of his ancestors, and the margrave's own portrait to this day asserts the superior powers of Stimmer in this department of art.

We have given his monograms in our second plate, and his principal work, excepting his bible, is "The Annunciation," in folio.

Jean Christopher Stimmer was born at Schaffhausen in the year 1552, and died at Paris some time about the commencement of the succeeding century. He was the brother and dis-

ciple of Tobias, and engraved on wood a great number of his compositions with considerable success, for he drew with ability, and hatched his engravings in a bold, but mellow style.

After the death of his brother, Christopher travelled to Paris, where he performed some engravings, and was commonly known by the name of "the Swiss," and where he died, leaving behind him a son, who also engraved on wood a considerable number of tablets after Francis Chaveau.

Christopher used the complicated cypher which will be found among those of our monograms of the second plate of the German school, and his best engravings are those which follow:—A set for the New Testament, with the Apocalypse, printed at Strasburg in the year 1588. A collection of portraits of the scholars and theologians of the German nation, printed also at Strasburg by Bernard Jobio, in 1591. "Icones Affabrae;" a collection of emblems printed in the same year, all of the 4to. size; and a capital print of an historical portrait of a kneeling figure, inscribed "Contrafacite Bildnus des Herrn Lafarus von Schwende," &c.

Jost or Jodocus Amman or Ammon, designer and engraver on wood and on copper, was born at Zurich in 1539, and died at Nuremberg in 1591. Not meeting with encouragement in his youth at Zurich, he travelled to Nuremberg, a city where the arts were reported to be in a flourishing state, the year he became of age, and in 1577 renounced the rights of a citizen of Zurich, in order the more firmly to attach himself to his adopted country. Strutt says of him, that if patience and assiduity of themselves could constitute an artist, Amman would well deserve that character, from the multitude of designs which he made, and the great number of plates which he engraved, amounting, according to Huber, to more than five hundred and fifty. But though a great genius may be improved by cultivation, yet it is equally certain that neither pains nor study can create a great genius. Much merit, however, was certainly possessed by our artist; who lived at a time when almost every book which appeared was ornamented with prints, and was employed by most of the great booksellers, especially Siegmund Feyerabandt of Frankfurt.

The engravings of Jost Amman upon copper are not equal to those which he performed for the letter press. His invention was not very copious: his figures are tolerably proportioned, and the detail of his drawing is careful and moderately correct; animals in particular he touched with great spirit. His style of engraving is neat and decided, yet if his lines are more regular, they are less free than those of many of his predecessors. He affixed various marks to his performances, as may be seen in our second plate of the monograms, &c. of the German school of engraving.

His principal works on copper are, a set of twelve illustrious women, beginning with Eve, under the title of "Eva die Geberin;" a set of figures of warriors, small uprights, marked Jost Amman inventor 1590; the set consists of eight, and there is a set of eight others, fighting with swords and sticks. The four seasons, and the four elements, dated 1569. A set of the twelve months, personified, and a set of sixteen friezes of hunting subjects; a considerable number of etchings of subjects of piety, after Winceslaus Jamitzer; the bombardment of a city, dated 1570, in folio, and the portrait of Carparis di Colignon, D. Cathilone, marked Jost Ammon figurinus, 1573.

His best engravings on wood are, "The Creation of Man;" "The Diet of the Empire," both in folio, the latter an oval. "The Marriage at Cana," in quarto; a set of one hundred and fifteen, entitled, "De omnium liberarum mechanicarum et sedentarium artium genera continens, &c. Edit. per Hoffmann Scoperman Francof. 1564." This work

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work consists of artists and artisans, represented in their respective employments: among them are some excellent figures, and in that which represents the engraver, Amman has given his own portrait. A second edition was printed A.D. 1574, and a third in 1588, but the first is now become very scarce. The book is a large octavo.

A set of one hundred and two, besides the portrait of Feyerabandt, for a Latin edition of Livy, printed at Frankfort 1572-3 in oblong quarto.

Another set for a folio edition of Pliny, printed also at Frankfort A.D. 1584. Another set for a quarto book of hunting, printed at Frankfort in 1582, which book was considerably augmented after the death of Amman, and reprinted in 1617. Another set of one hundred and three of ecclesiastical habits, dated 1564, and another of one hundred and twenty, for "Gynæceum, sive Theatrum Mulierum, in quorum præcipuarum omnium per Europam, &c." in oblong quarto, printed at Frankfort, 1586.

Christopher Maurer engraved from his own compositions, and from those of T. Stimmer, both on copper and on wood. He was born at Zurich A.D. 1558, and died at Wintertour in 1614. His father Joshua was an artist, and under the paternal roof he learned the rudiments of art, but was afterwards removed to Strasburg, and placed under Tobias Stimmer, where both the master and scholar were close students, and soon began to be distinguished by the number of interesting and beautiful works which they produced.

The cypher of Maurer will be found in our second plate of German monograms. After passing some years in the school of Stimmer, he returned to his native city, and added to his reputation by his fresco pictures which adorn the façades of distinguished houses, and by the just likenesses he displayed in his portraits; with the true spirit of a Swiss artist, he always preferred patriotic subjects, and has often painted the origin of the Helvetic confederacy.

Of his engravings, those on copper are most sought after by connoisseurs, particularly a set of bible cuts, and four emblematical etchings relative to proceedings in the courts of law, which, after the death of the artist, were introduced into a Latin book.

Of his letter-press engravings, which are neatly executed, the best are probably the set of animals of the chase, which he executed in conjunction with his master, and which were published at Strasburg in the year 1605. And a set of the bible under the title of "Historische Vorstellungen über die ganze Bibel," which do honour to his inventive talent, as well as to his manual powers as an engraver.

Christopher Jamitzer, or Jamnitzer, was born at Nuremberg in the year 1560, and died in the same city in 1617. He performed several etchings which are marked with the cypher which the reader will find among our monograms of the German engravers, but they are far from being of first rate merit.

Of the same family were Bartholomew and Wenceslaus Jamitzer, whom we pass as unimportant persons.

The best works of Christopher consist of groups of boys variously occupied, and the best of these groups are those which follow: A set of twelve, in 12mo.; another set of twelve, mounted on marine animals; another set of four combined with swans, flowers, &c.; four children dancing in an arbour. A set of grotesque chimeras, in quarto; Christopher Jamitzer also engraved a portrait of himself sitting in a perspective machine, in the act of drawing or measuring.

Matthew Greuter was born at Strasburg A.D. 1564. He travelled more than once to Lyons and Avignon, and from thence to Rome for professional improvement, in which latter city, in the year 1638, he died.

Strutt describes him as a man of genius, but so much praise as is implied in this word, cannot justly be allowed him. He worked partly from his own compositions, but his drawing is by no means correct; his extremities in particular being sadly neglected. He sometimes executed his plates with the graver only, in a neat style, and in other instances has employed etching. His principal productions are, the portraits of the popes Innocent X., and Sixtus V., the latter surrounded with an ornamental border in which the papal coinage is introduced. Cardinal Seraphinus Olivarius Razzalius; all in quarto.

Of his historical works we shall only mention "The Virgin and Child," seated in a landscape, after Baroccio. MARY Magdalen leaning her right hand upon a skull, after S. Gaetano, dated 1584; both in quarto. An emblematical print of Venus standing on a globe, with various virtues and vices personified, very neatly finished, and marked M. Greuter inv. et fec. 1587, in small folio. "The Fall of Phaeton," after Windel Dieterlm, in large folio, dated 1588. "The Destruction of Troy," after Lanfranco, and the magnificent cavalcade of the emperor Charles V. engraved by Greuter in concert with Lucas Vorsterman, a large print of the frieze form, engraved on several plates.

As Jean Frederic, the son of Matthew Greuter, was born at Rome, and lived and died in Italy, our account of him will be found under *ITALIAN School of Engravers*.

Matthias Kager was born at Munich in the year 1566, and died at Augsburg in 1634. He studied in Italy, and beside ranking high among the historical painters of his time, was an engraver of merit. His style is neat, and performed chiefly with the graver, though sometimes with the admixture of etching. His attachment to liberty, and aversion to the manners of a German court, induced him to quit that of Bavaria, and he became a citizen and finally a burgomaster of Augsburg.

S. Kilian engraved a portrait of him in 1626. The best of his own prints are: "The Adoration of the Shepherds," dated 1610. "St. John Baptizing Christ in the river Jordan," both of the folio size, and from compositions by himself: "The Holy Family," in an oval, also from his own picture, and in 4to. and "St. Francis surrounded by the Monks of his Order, to whom Christ and the Virgin Mary are appearing in the Clouds," a middling-sized upright from P. Remigius Bozzolo.

Of Adam Elsheimer, surnamed Adam of Frankfort, who should else have been mentioned in this place, we have already spoken. See *ELSHEIMER*.

Theodore Kruger, or Cruger, was born in the city of Munich A.D. 1576. He travelled to Italy for improvement, where he formed his style of engraving on that of Francisco Villamena. He handled the graver, which was the sole instrument of his art, with boldness, freedom, and facility, but his chiaro-scuro is very defective, and his outlines incorrect and hard.

His principal engravings are: "The Life of St. John the Baptist," on twelve upright folio plates, after Andrea del Sarto, with the portrait of the painter prefixed, and dedicated to Cosmo de Medicis, dated 1618. "The Last Supper," in large folio, after the same. "The return of the Holy Family from Egypt," where the infant is embracing Jesus Christ, after F. Bigio, also in folio. "The infant Saviour blessing the little St. John," after the same painter. And "A Prince on a Tribunal, surrounded by divers Statesmen," after Lanfranco, and inscribed "Vox mihi."

Cruger has also engraven some portraits after Gabriel Wayer, to which he signs his name Dietrich Cruger, by which Christian name he is best known in Italy.

Theodore

## GERMAN SCHOOL OF ENGRAVING.

Theodore Cruger, the younger, was born in the year 1648, and was the son of the preceding artist. The Italians call him Della Croce, the Flemings Vercurys, and the German Kruger. In the year 1710, he engraved, in concert with two others, the Florentine gallery. He also engraved "St. Francis at Prayer," after Carlo Maratti, and a couchant Venus, both in folio, beside several portraits, among which is the daughter of Giorgione, after that master; and Ludovicus Adimari, after P. Dandini.

Dominic Custos, otherwise called Baitens, was the son of Pierre Balthasar Baltens, a painter and poet, who had some pretensions also to knowledge in the art of engraving. He was born some time about the year 1560 at Anvers, and died at Augsburg in 1612. His real family name appears to have been Baltens, but he settled at the last named city, at an early age, under the name of Dominique Custos, and marrying there the widow of Barthelemy Kilian, the elder, was enabled to establish a lucrative print trade, which continued to flourish for a long period of time.

Custos had several daughters, of whom some were educated to the art of engraving, and succeeded tolerably well. He worked in a neat style, entirely with the graver, but his prints are laboured, tasteless, and without harmony of effect. Florent le Comte says he engraved portraits in the taste of Vandyke, but as Strutt properly remarks of this mistaken assertion, there is not the least resemblance between the stiff portraits of Custos, and those so highly and so justly esteemed by Vandyke.

The principal engravings by this artist, are; the effigies of the German emperors, large whole length figures, in folio, dated 1601.

The portraits of the Fuggera family, of which the first edition, which is now become very rare, and is dated 1593, contains but sixty-four portraits: in the second the number of portraits is increased to sixty-seven: the third contains a hundred and twenty-seven, besides the arms of Fuggger, and an ornamented title, but the names are added, of Lucas and Wolfgang Kilian. Another set of portraits of heroes, &c. entitled "Atrium Heroicum, Cæsarum, Regum, aliorumque summatum ac principum, &c."

The chief of his engravings of separate portraits are those of pope Sixtus V. prince Sigismund in the costume of Moldavia, after J. ab. Ach, and from the same painter Marcus Bragadino, dated 1591. Christianus II. duke of Saxony, Henry bishop of Augsburg, (in an oval.) Johan Philippi, bishop of Bamberg, ditto. Maximilian, duke of Bavaria, and Elizabeth Lotharingea his wife, a pair of ovals, dated 1598, all of the folio dimensions.

The most esteemed of the historical works of this artist, are a set of "Female Saints," half lengths, after Franz Aspruck. A set of four in folio, of "L'Histoire de l'Enfant prodigue," and "Judith beheading Holofernes," after John Von Auchen, of the folio size.

Lucas Kilian, the patriarch of a numerous progeny of engravers, was born at Augsburg in the year 1579. Under whose directions he studied, is not known, but the works of Henry Goltzuis and Muller appear to have been his school. It appears, however, that he went to Italy, in order to complete his studies, where he engraved several plates from the pictures of the great Italian masters: but returned, and died in his native city in the year 1637.

"Few artists have manifested a greater command of the graver than Kilian; whether we consider the apparent facility with which his strokes are turned over each other, or the firmness with which they are executed, one cannot help admiring the author, though it evidently strikes us that by paying too close attention to this part of his art, he neglected

the correctness of his outlines, and fatigued the lights with unnecessary work." Such is the opinion of our countryman Strutt: to which should be added, that his drawing is not accurate, nor his chiaro-scuro broad and impressive.

Of the numerous works of Kilian, the following are held in most esteem: "The Adoration of the Shepherds," a middling-sized plate, from the younger Palma. The same subject, a large upright, after Spranger. Another of the same subject, after Rotenhamer. And another (a large upright) from J. Heintz. "A Holy Family," from Cornelius de Haerlem, and "The Miracle of the Loaves and Fishes," from Tintoret: both large uprights. "Christ Praying in the Garden," a small upright, arched at the top, from Frederic Sutfies. "A dead Christ," from Michael Angelo. And "A Nymph and Satyr," from J. Heintz, both small uprights. "The Rape of Proserpine," a large folio plate, from the same master. "The Entombing of Christ," an upright, without the painter's name, dated 1600, which perhaps, with many other of the engravings of Lucas Kilian, is from his own design.

The best portraits by this master, are those of himself, aged 55, a rare print in 4to. "Petrus Custos, vulgo Baltens, Pictor et Poeta Antwerpianus," dated 1609. Nicholas Christophe, Prince de Rudzivil, both in 4to. The emperor Christian II. dated 1615. Maria Eleonora Suevorum Gothorum Regina. Gustavus Adolphus Suevorum Gothorum Rex. And Albert Durer, a half-length; all of the folio size: but whether the latter is from a picture by Rotenhamer, or after Albert Durer himself, the present writer is uncertain.

Wolfgang, the brother of Lucas Kilian, was also of Augsburg, and born in the year 1581. He studied under Dominic Custos, and, after his return from Italy, under his brother Lucas, whose style he imitated without attaining to the same degree of excellence: his prints are somewhat neater, but more stiff and formal.

Wolfgang employed the greater part of his time in engraving portraits, of which the following are those of most importance. Ernest Count Mansfield. Maximilian of Wallenstein, dated 1642. Jean Major, mathematician of Augsburg. Frederic Baron de Teuffenbach. Jean Godefion, bishop of Wurzburg, and Ferdinand III. king of the Romans, all in 4to. Of the folio size; the archbishops of Mayence, Cologne, and Treves; his own portrait, inscribed "Labor improbus omnia vincit," and a set of twenty-seven of the emperors and archdukes of the house of Austria, from 1229 to 1623, with their lives and eulogiums, published at Augsburg, in 1629.

The most esteemed of his historical works, are the "Baptism of Jesus Christ," after Paolo Veronese. "The Assumption of the Virgin Mary," after Tintoretto; "The Descent from the Cross," after Paolo Farinato, and the "Good Samaritan," after Giacomo Bassano, all in folio. "The Resurrection of Christ," arched at the top, after F. Bassano. The four Evangelists, in upright ovals, from his own designs: and the "Festival of the Peace of Westphalia," after Joab Sandrart, in large folio, engraved on two plates, and which is now become a rare print.

Bartholomew Kilian, the third son of Wolfgang, was born at Augsburg in the year 1630, and died in the same city in the year 1696. He distinguished himself at a period of life so early, that Sandrart emphatically says, "he was born an artist." At the age of eighteen he engraved a Magdalen after M. Gondelach, which induced his father to place him under M. Merian of Frankfort, after studying with whom two years and a half, he travelled to Paris for further improvement. Here he remained more than three years, availing himself of the instructions of different artists, and

## GERMAN SCHOOL OF ENGRAVING.

work consists of artists and artificers, represented in their respective employments: among them are some excellent figures, and in that which represents the engraver, Amman has given his own portrait. A second edition was printed A.D. 1574, and a third in 1588, but the first is now become very scarce. The book is a large octavo.

A set of one hundred and two, besides the portrait of Feyerabendt, for a Latin edition of Livy, printed at Frankfurt 1572-3 in oblong quarto.

Another set for a folio edition of Pliny, printed also at Frankfurt A.D. 1584. Another set for a quarto book of hunting, printed at Frankfurt in 1582, which book was considerably augmented after the death of Amman, and reprinted in 1617. Another set of one hundred and three of ecclesiastical habits, dated 1564, and another of one hundred and twenty, for "Gymnasium, sive Theatrum Mulierum, in quorum præcipuarum omnium per Europam, &c." in oblong quarto, printed at Frankfurt, 1586.

Christopher Maurer engraved from his own compositions, and from those of P. Stimmer, both on copper and on wood. He was born at Zurich A.D. 1558, and died at Wintert-hour in 1614. His father Joshua was an artist, and under the paternal roof he learned the rudiments of art, but was afterward, removed to Straßburg, and placed under Tobias Stimmer, where both the master and scholar were close students, and soon began to be distinguished by the number of interesting and beautiful works which they produced.

The cypher of Maurer will be found in our second plate of German monograms. After passing some years in the school of Stimmer, he returned to his native city, and added to his reputation by his fresco pictures which adorn the façades of distinguished houses, and by the just likenesses he displayed in his portraits; with the true spirit of a Swiss artist, he always preferred patriotic subjects, and has often painted the origin of the Helvetic confederacy.

Of his engravings, those on copper are most sought after by connoisseurs, particularly a set of bible cuts, and four emblematical etchings relative to proceedings in the courts of law, which, after the death of the artist, were introduced into a Latin book.

Of his letter-press engravings, which are neatly executed, the best are probably the set of animals of the chase, which he executed in conjunction with his master, and which were published at Straßburg in the year 1605. And a set of the bible under the title of "Historische Vorstellungen über die ganze Bibel," which do honour to his inventive talent, as well as to his manual powers as an engraver.

Christopher Jamitzer, or Jamtizer, was born at Nuremberg in the year 1560, and died in the same city in 1617. He performed several etchings which are marked with the cypher which the reader will find among our monograms of the German engravers, but they are far from being of first rate merit.

Of the same family were Bartholomew and Wenceslaus Jamitzer, whom we pass as unimportant persons.

The best works of Christopher consist of groups of boys variously occupied, and the best of these groups are those which follow: A set of twelve, in 12mo.; another set of twelve, mounted on marine animals; another set of four combined with swans, flowers, &c.; four children dancing in an arbour. A set of grotesque chimeras, in quarto; Christopher Jamitzer also engraved a portrait of himself sitting in a perspective machine, in the act of drawing or measuring.

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The best portraits by this master, are those of himself, aged 55, a rare print in 4to. "Petrus Custos, vulgo Baltens, Pictor et Poeta Antwerpianus," dated 1609. Nicholas Christophe, Prince de Rudzivil, both in 4to. The emperor Christian II. dated 1615. Maria Eleonora Suevorum Gothorum Regina. Gustavus Adolphus Suevorum Gothorum Rex. And Albert Durer, a half-length; all of the folio size: but whether the latter is from a picture by Rotenhamer, or after Albert Durer himself, the present writer is uncertain.

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## GERMAN SCHOOL OF ENGRAVING.

here he engraved his "Assumption of the Virgin," after Philip Champagne, and "Crucifixion," after Teiselin.

Returning to his native city, he continued to cultivate his art, and produced a great many excellent portraits, with some few historical subjects. Strutt is mistaken in saying he worked entirely with the graver, but is right in what he asserts of the originality of Bartholomew's style. He worked in a manner entirely different from those of the Kilians, who had preceded him; sometimes, in order to make a striking distinction between the flesh and the draperies of his figures, he finished the former with dots only; and at other times expressed the darker shadows of his flesh by lines, which he blended with dots in the lighter parts. Mariette and Barthelemy talk of him as an example for a painter, but these writers are warmer in his praise than an inspection of his work will fully warrant.

B. Kilian generally marked his engravings, of which the following list contains the principal, with his name at length, but sometimes used only his initials, and at others, according to Huber, a cypher which does not appear to belong to him, but which we have copied, with others of the Kilian family, in the second plate of our German monograms.

Six half length portraits, in folio, of celebrated protestant preachers at Augsbuurg, after B. Hopper. Three medallions of archbishops of Salzburg, with allegorical accompaniments, after Henry Schoenfeldt. Johannes III. king of Poland, after Bloemart, dated 1681, a large bust of learned execution. Maximilian Emanuel, electoral prince of Bavaria, with historical accessories, a celebrated work, and the subject of a thesis. The emperor Joseph as king of the Romans, on horseback, the subject of another academical thesis, dated 1694; which Huber pronounces one of the finest prints existing for natural grandeur; all these are in large folio. The portrait of Augustus II. Abbas Einfeldensis, is a large upright folio, dated 1686.

The best historical production of Bartholomew is a "Madonna and Child," a beautiful engraving in large folio, after Caspar Sing.

Philippe Kilian was a younger brother of Bartholomew, imitated his style, and confined his talents almost entirely to portraits. He engraved, among many others, the portrait of his elder brother, whom he never equalled, though many of his works possess no small portion of merit.

Strutt mentions another engraver of this family of the name of Wolfgang Philip, who flourished in the next century, and who executed a great number of portraits, which however have too little merit for our particular notice.

Yet to shew that nature had not exhausted the Kilian stock of talent, we shall here mention a little out of his chronological place, Philippe Andrea Kilian, great nephew of Bartholomew, who was born at Augsbuurg A.D. 1714, and died in that city in the year 1759.

Descended from a family of artists, he imbibed, in early life, what may perhaps be termed an hereditary taste for fine art. He first studied drawing and engraving under Frederick of Augsbuurg, and afterwards became the pupil of G. M. Priesler of Nuernberg, where he distinguished himself by engraving some plates for the "Physica Sacra of Scheuchzer," and laid the foundation of his future fame.

Some years after, whilst engaged in engraving from the Dresden gallery, the reputation of our artist stood so high, that Augustus III. of Poland emphatically called him "the Magnet of Dresden," and when any other engraver produced an inferior plate from the collection, was used to say, in the way of delicate reproof, that it ought to be re-engraved by Kilian.

But our artist, notwithstanding these honours, felt so much restraint, whilst residing at the court of Dresden, or such

passionate desire to return to his native city, that he sought an occasion to make such arrangements as enabled him to quit Bavaria after a residence of some years.

P. A. Kilian is usually reckoned among the most meritorious historical engravers of Germany. On a basis of found drawing, he erected rather a singular style of execution; he interworked his principal or first course of lines with very delicate strokes, which he crossed with a course of lines exceedingly lozenge upon the first, and sometimes added a third course somewhat more square; at other times he interworked his shadows with long slender *pecks*, as they are technically termed among engravers. But the characters of his heads are not equal to his general knowledge of the human figure.

His best historical engravings are, "Jesus Christ at prayers in the Garden of Olives," an upright plate of the folio size, from a design of his own. "The Adoration of the Kings," after Paolo Veronese; "The Woman taken in Adultery," after Tintoret; and "The Family of a noble Venetian," after Paolo Veronese, are all large folio plates, executed for the Dresden gallery. "Mary Magdalen washing the Feet of Christ" is from Nicholas Gralli; "The Baptism of St. Augustin," from J. B. Pittoni; and "Herodias with the Head of John the Baptist," from Carlo Dolce, are all of folio dimensions; "Regina Angelorum," where the Virgin appears surrounded by Angels in Glory, after Bergmuller, and another from the life of the Virgin, after C. T. Scheffler, are a large and highly esteemed pair of engravings. But perhaps his most justly celebrated work is a very large plate of "St. Cosmo and St. Damien," after J. Wolfgang Baumgaertner.

The best portraits from the graver of Philippe Andrea, are those of Francis I. emperor of Germany, in a coat of armour, after Meitens. And Clemens Rezzonico Venetus, Pontif Max, after G. D. Porta, a pair in large folio. Maria Theresia, queen of Austria, an upright folio. Johan Martin Christell, from a picture by P. A. Kilian, himself. Christoph Henry Andre Geret, after J. Romelli. Field-marshal Curtius Christophel Graf von Schideren, after Straz. Ferdinand, duke of Brunswick, general in chief of the allied army, after Ant. Pesne; and Godofredus Schnurbein, marked P. A. Kilian, pinx. et sculp. 1750, all of the folio dimensions.

George Christopher Kilian, another engraver of the same family, was living at Augsbuurg when Heinnekin published his "Idée generale d'une Collection complete d'Estampes," and perhaps may be living still.

Isaac Major was born at Frankfort on the Maine in the year 1578, and died in 1630. Discovering an early inclination for the arts of design, he was placed with Roland Savery, under whom he studied landscape painting for a time, but desirous of becoming an engraver, he placed himself, for instruction in that art, with Giles Sadeler. He united etching with the work of the graver, but his works want energy, though they were held in some estimation at the time in which he lived. His principal productions are, a set of six middling sized landscapes, wild scenes in Bohemia, from Pietro Stephani. A very large landscape from Rowland Savery, in which St. Jerome is introduced. Another set of eight mountainous and savage landscapes in Bohemia, in large folio, after Jer. Wolf, and an allegorical portrait of the emperor in a car of triumph drawn by eagles and swans.

Christopher Jegher was a justly celebrated engraver on wood, who was born some time about the year 1590, but the incidents of whose life are but little known. He established himself at Antwerp when he was about thirty years of age, where his extraordinary merit so strongly recom-

mended.



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mended him to Rubens, that he was engaged by that great master to engrave a considerable number of his compositions, and it is no small praise to add that he succeeded to the perfect satisfaction of the painter.

After the death of Rubens, Jegher re-purchased most of these engravings, and published them on his own account. Collectors should therefore bear in mind, that those impressions, from which the name of Rubens as the publisher is taken away, and that of Jegher substituted, are of the second edition, and consequently of inferior value to the first.

There is a degree of freedom and vigour in the style of Jegher that is perfectly homogeneous with that of Rubens; his hatchings are broad and powerful, and the imitation of the cross hatchings is so well expressed, that his best prints very much resemble drawings made with the pen and ink. He drew with masterly correctness; the extremities of his figures are well marked; and his heads, though slight, are full of expression.

His best, and by far the greater of Jegher's productions, are after Rubens, but he has engraved a Crucifixion after F. Franck, which is dated 1637, and some few more from other masters.

The following are after P. P. Rubens: "Sufannah surpris'd by the Elders." "A Repose in Egypt," both in large folio. Some of the latter are printed in chiaroscuro, (*i. e.* with an additional block or two to add the demitints,) and are now become scarce. "The infant Christ and St. John playing with a Lamb." "The Coronation of the Virgin Mary," and "The Temptation of Christ in the Desert," all middling-sized folios. "Hercules destroying Envy and Discord," is from the ceiling at Whitehall. "The Conversation of Lovers," is a very large garden-scene, engraved on two blocks. "A drunken Silenus supported by Satyrs," is of the upright form, and a very fine composition of the master, which was also engraven on copper by Bolfwert.

Matthew Merian, the elder, was born at Basle in the year 1593. His first studies were under the direction of Theodore Meyer, who instructed him in drawing. He afterwards became the disciple of Theodore de Brie. He was a man of talent, and his principal engravings are landscapes, which he etched in a slight free style, and finished with the graver. His views have much of that rare but valuable topographical quality, the appearance of having been really copied from the places of which they bear the names, and which quality Merian had the skill and the honour of imparting to his disciple Wenceslaus Hollar, of whom we have given an account in our progress of ENGLISH engraving, but whose monograms will be found in our third plate of those of the German school.

Merian married the daughter of his tutor de Brie, by whom he had issue: he died in the year 1657, aged 58, at Frankfort, or, according to some of his biographers, at Schwalbach.

His works, according to Le Compte, amount to upwards of five hundred plates. They are well known, and there is not so much disparity in their merits as to make a selection here either easy or necessary. His marks and monograms are five in number, as will be found in our third plate.

Of Matthew Merian the younger, who was for a short time in London, we have made slight mention in a former place.

His daughter, Maria Sybilla Merian, was a much more distinguished character. She was born at Frankfort on the Maine in the year 1647. At the age of four years she lost her father, which in most cases is a great misfortune, but not so here, for her mother found in her second husband, Jacques Morell, a kind and indulgent protector, who fostered the infant genius of Maria.

Morell, as is well known, was a distinguished painter of fruits, flowers, and insects, and under his instruction our young artist soon distinguished herself as a painter and natural philosopher, to which attainments she afterwards added the art of etching.

In the year 1665 she married Jean André Graf, a meritorious painter of Nuremberg, who studied in the school of Morell. In 1679 she published the first volume of her "Histoire des Insectes de l'Europe deslins d'après nature, et expliqués par Marie-Sybille Merian; où l'on traite de la génération et des différentes metamorphoses des insectes et des plantes dont ils se nourrissent;" and in 1683, she published the second volume of the same work, in the execution of which she paid attention to the engravings, as well as the designs, it being the first work wherein is displayed the minutia which is so important in the eye of the connoisseur, and she managed the etching needle with the dexterity she had before evinced in the management of her pencil.

In the course of the next year, she returned to Frankfort with her family, and, from a mistaken zeal in religion, separated from her husband; retired with her mother and two daughters to Well Friedland, and became a member of the society of Labadistes. The fraternal society of Labadistes, (who called themselves brothers and sisters) had then assembled under Peter Yrond, and their head-quarters were the castle of Den Bosch, situated between Franeker and Levardin, or which the possessor's name was Sommerdyck. Here she remained a considerable time, and here she had opportunity to inspect at leisure a fine collection of the insects of America, of which she made very exact drawings, and from hence her thirst after professional knowledge led her to make occasional excursions to Amsterdam and other parts of Holland, which at that time abounded with cabinets both of pictures and natural history.

Her enthusiasm now took a new turn, and coinciding with the wishes of the Dutch naturalists, she was induced, in the year 1699, to undertake a voyage to Surinam. On her arrival, after an agreeable passage, a wide field opened to her professional ambition. She painted the insects and reptiles of the country on vellum, and examined with philosophical care their various habits and changes: but the heat of the climate, and her intense application, having injured her health, it became necessary for her to return to Europe in the following year.

She brought home an ample collection, not only of drawings, but of shells, dried insects, &c. She now settled at Amsterdam, and immediately set about publishing the fruits of a voyage, than which none had ever been performed more truly interesting to the naturalists of Europe.

Of the sixty large folio plates contained in her "Metamorphoses Insectorum Surinameum, &c." several were executed by herself, and she also supplied the descriptions. It was published at Amsterdam in the year 1705.

In the second edition, which was published by the physician Jean Marret, in the French language, more plates and explanations were added by the author, who consecrated the remainder of her days to delineations and researches of this nature.

Too far advanced in life to venture on a second voyage, yet knowing that much had been left unaccomplished at Surinam, Maria Sybille now formed the design of sending thither her eldest daughter, who had accompanied and assisted her in her former voyage. Jeanne Helene cheerfully undertook the commission, lived at Surinam, painted with hereditary skill all the remaining subjects of natural history that she could find intercing in the country, added her remarks, and transmitted them to Amsterdam; but death had now interposed to prevent this consummation of the pleasures of Maria Sybille.

Sybille. The supplement was however published by her second daughter Dorothea Maria, who was born in 1678, and herself painted flowers and insects with great ability.

The curious, who would form an adequate idea of the knowledge and talent of this extraordinary artist, should visit the principal cabinets of Holland. Yet in our own national collection at the British museum, are some volumes of her paintings on vellum, which are almost daily turned over with wonder by its numerous visitants.

John William Baur was a very meritorious painter and engraver of landscape and history. He was born at Straßburg in the year 1600, studied under Frederic Brendel, and afterwards in Italy, where he resided a considerable time, and where he was patronized by the duke at Bracciano and prince Guistiniani. In the year 1637 he removed to Venice, and from thence to Vienna, and died there three years afterwards, at the age of forty.

The landscapes which he painted with water colours on vellum are particularly celebrated, and he engraved a vast number of plates from his own designs, some of which are in a style resembling that of his contemporary Callott, to which he affixed the cypher which the reader will find in the third plate of our monograms, &c. of the German school of engravers.

Melchior Kuffell completed the volume of his works, which contains not less than five hundred engravings, after the death of Baur, whose "designs," in the language of Strutt, "manifest great marks of a superior genius, but without cultivation." The cypher with which he usually marked his engravings, of which the following are the names of the principal, will be found in our plate of monograms.

Portrait of Don Paolo Geordano II; Orsino, duke de Bracciano, an oval, dated 1636, a rare print; a set of eighteen, of the costume of different nations; a set of fifteen of the battles of various nations, entitled "*Caprici di varie Battallie*," in quarto; another set of fourteen battles; a set of eight landscapes, and another of four, entitled "*The Elements*." A set of twenty of a superior character, of the battles of "*La Guerre Belgique*," and

His principal work, consisting of one hundred and fifty plates in quarto, from Ovid's metamorphoses, published at Vienna in 1641. These are slightly etched, and finished with the graver. The figures introduced are generally small and incorrect in the drawing, the back-grounds rather dark, and the trees deficient in lightness and freedom. The architecture, which Baur is fond of introducing, is well designed, and correct in the perspective.

Hans or Jean Ulric Franck was a native of Kaufbeuren, an imperial city of Suabia, born in 1603, and was particularly excellent in painting and etching small figures. He settled at Augsberg, where he died in the year 1680.

In conjunction with Susan Sandrart, A. Zelt and J. Meyer, Franck engraved a set of the Fountains in Rome and its environs. The best of his other engravings are four combats in quarto, dated 1643. "*David and Abigail*," and "*Alexander defeating Darius*," dated 1644, and both in folio.

Joachim Sandrart was born at Frankfort on the Maine in the year 1606, and began his career of art by studying under Theodore de Brie and Matthew Merian, of whom we have spoken. At the age of fifteen he went on foot to Prague, to visit and obtain instruction from Giles Sadeler, after which he placed himself under Gerard Honthorst, of Utrecht, to learn the principles of painting, with whom he travelled to England. He afterwards visited Venice, Bologna, Naples, and Rome, and received instructions from Titian, Paul Veronese, Guido, Guercino, Poussin, and others: in short, if instruction and example alone could have produced a

great artist, Joachim should have been the first of his time. He returned however to Germany, and finally settled at Nuremberg, where he established an academy of art, and where he died ten years afterwards, at the age of 77.

Sandrart was rather an artist of acquirement than of genius, and hence his works are deficient in vividness and warmth. He painted and engraved history and portrait; he was also a man of letters, and his "*Academy of Architecture, Sculpture and Painting*," which was first published at Nuremberg in the year 1679, though prolix, is still celebrated through Europe.

This book, which contains much historical information, and the biography of the most distinguished artists, is enriched with a considerable number of engraved portraits, beside other prints. It was first published in the German language, but an edition in Latin was printed in the year 1683, and it has since received various additions from the successors of Joachim Sandrart.

His own engravings are performed chiefly with the point, and the best of them will probably be found to be a half length figure of the goddess Flora, after Titian; an elderly woman contemplating a Cupid in no very delicate action: and "*The Death of Cleopatra*," from his own compositions, all in quarto.

Jacques Sandrart, the nephew of Joachim, was born at Frankfort in the year 1630, and died at Nuremberg in 1708. He studied engraving at Amsterdam under Cornelius Dankerts, and afterwards at Dantzic under W. Hondius.

He settled finally at Nuremberg, where he pursued his art with singular industry, the number of his portraits alone being not fewer than four hundred, some of them of the folio dimensions, and executed with the graver alone, in a clear and neat style, beside which he published a number of geographical charts and other engravings.

His portraits are not uncommon, and among the most meritorious will be found to be those of his uncle Joachim Sandrart, a half length figure, inscribed "*Seculi Nostri Apelles*." The busts of Rodolphus II., Ferdinand II., Ferdinand III., and Frederic, prince of Norwegia and duke of Sleswic; a half length of Hohannes Michael Délherrus, after R. Wernfels; Ermuth Sophia, electoral princess of Saxony, &c. Johannes Paulus Auer, painter of Nuremberg; Joachim Sandrart, junior, dated 1688; all in folio.

Jean Jacques Sandrart, the son of Jacques, whom we have just dismissed, was born at Ratibon A.D. 1655, and died at Nuremberg in 1698. He studied the arts of design under his father and his great uncle Joachim; his works prove the facility of his invention. He enriched the volumes of Joachim with several tasteful and spirited etchings, and his portraits, which are etched, and finished afterwards with the graver, are deservedly held in esteem. His best works are, the portraits of Elizabeth Henrietta, princess of Brandenburg, surrounded by emblems; and Silvius Jacob de Dunkelmann, both in folio, after Adam le Clerck; "*The Holy Family*," after Joachim Sandrart; "*Aeneas saving his Father from the Flames of Troy*," after Raphael, dated 1682. "*Marphorius, or the Statue of the Rhine*," among ruined edifices; "*The Nile*" among ruined monuments of antiquity, all in folio, and the latter pair, with many others after Joachim, are introduced into his "*Academy*, &c."

Jean Jacques also engraved several plates of merit for a folio work, entitled "*Suecia Antiqua et Hodierna*."

Susan Marie Sandrart was the sister of Jean Jacques, and was born at Nuremberg in the year 1658. She studied under the direction of her father, and engraved with some ability a considerable number of plates of ornaments.

She engraved also a Bacchanaal, with the inscription "*Immode-*

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*moderatum dulce Amorum;*” “The Assembly of Gods at the Marriage of Cupid and Psyche,” after Raphael, and the antique bas relief of “The Aldobrandini Marriage,” after Pietro Santo Bartoli, for the academy of Joachim Sandrart, all of the folio dimensions.

Of Hollar, who flourished about this time at Prague, we have already spoken. See Origin and Progress of ENGLISH Engraving.

That extraordinary artist, Adrian van Ostade, for an account of whose merits as a painter, see the article OSTADE, performed about this time some etchings, which are very justly admired for their freedom and spirit. They are not all executed in the same style, though the same mind be every where evident. Some are dark and coarse, and were printed just as the aquafortis left them, while others are more neatly executed, and appear to have been subsequently worked upon with the triangular point, as was the custom of Rembrandt and Worlidge. The two marks with which Ostade occasionally subscribed his etchings, will be found in our third plate of the monograms of the German school.

The whole of his etchings consist of at least fifty-two plates of various dimensions, all from his own designs, of which the following are perhaps most worthy of being specified: “Several Peasants at the Door of a Cottage,” with a fair in the back ground, a middling-sized upright. “A Dutch Wake,” the same. “Several Peasants Fighting with Knives,” a small plate, lengthways, dated 1658. “The Cottage Dinner,” the same, dated 1653. All these are in his bold style of etching. Those which follow are such as he finished with more care. “The Painter,” with an inscription beginning in this manner: “*Pictor Apelle, pingas,*” and the first impressions of this plate are with the cap considerably above the eyes of the figure; in the second impressions, the cap nearly touches the eyes. “A Mountebank,” a small upright plate, arched at the top. “The Spectacle Seller,” a small upright plate. “A Man, Woman, and Child, at the Door of a Cottage,” a middling-sized plate, lengthways, dated 1652. Several peasants, half figures, at a window, one of them is singing a ballad, and another holds the candle, a small upright plate. “A Man Leaning over a Hatch, blowing a Horn,” the same. “A Cottage Entertainment,” with figures dancing, a middling-sized plate, lengthways.

The biographers of lieutenant-colonel de Siegen, (an officer in the service of the landgrave of Hesse,) have contested with the friends of prince Rupert for the honour of the invention of mezzotinto. The lieutenant-colonel was born in the year 1620, and, according to the baron Heinekin, executed in that manner a portrait of the princess Amelia Elizabeth of Hesse Cassel, in 1643.

For an account of prince Rupert’s pretensions to the discovery, see the article Origin and progress of ENGLISH Engraving. “An Holy Family,” after Caracci, in folio, is also mentioned (but without a date) as a mezzotinto production of Siegen.

Jean François Ermels, who possessed considerable talents in the art of painting and engraving landscapes and cattle, was born in the environs of Cologne in the year 1621, and died at Nuremberg in 1693. He studied under J. Holzmann and Jean Both, and the following plates, consisting chiefly of landscape scenery, adorned with ruined edifices and animals, were etched by him with great spirit and freedom. A pair of upright landscapes, “A Rocky Scene, and a composition of Ancient Architecture,” in 4to. “A Landscape,” in which the figures introduced are a faun and bacchante. Another, with monuments of antiquity. And a pair of “Pastoral

Scenes,” with shepherds, cattle, and ruined edifices, all of the 4to size.

Matthew Keefell, or Kysell, was born at Augsberg in 1621, and died there in the year 1682. He successfully mingled the work of the graver with that of the point, and his best prints, which are named in the following list, possess a large share of merit. The portraits of Christopher Benden, in 4to. Carolus Sulzer. Adolphus Zobelius. Andreas Winkler. Johannes Michael Dillherrus, after Ulrichus Mayr (an highly finished head in an octagon border). Leonardus Weissius, after Jos. Werner, all in folio. A set of forty-two after Ludovico Burnacini, entitled “*Il Pomo d’oro,*” and consisting of scenic decorations, &c. dated 1668, are folio etchings: and the only historical work from his hand, with which we are acquainted, is “The Virgin and Child,” apparently from a composition by himself.

Melchior Keefell, the brother of Matthew, was born at Augsberg in the year 1622, and died in the same city in 1683. Here he acquired the rudiments of his art, but perfected his studies under Merian of Frankfort, from whence, after residing some few years, he returned to Augsberg, and began to engrave the “*Iconographia,*” of Wilhelm Baur, a folio work, which consists of one hundred and forty-eight prints of various sizes, consisting partly of the “*Life and Miracles of Jesus Christ,*” and partly of views of the “*Seaports and Gardens of Italy,*” which work was published at Augsberg, A. D. 1682.

Strutt says of this artist, that “there is something very agreeable in his manner of engraving, especially when he confined himself to subjects where the figures are small, for as he drew but incorrectly, his figures appear defective, as they increase in size.” Baur was fond of ornamenting the back-grounds of his compositions with superb buildings, which Keefell has executed with much spirit; his rocks also, and mountainous distances, have great merit; but his trees want freedom, lightness, and characteristic determination of their foliage; his chiaroscuro is also spotty and fatiguing to the eye, if this be not rather the fault of Baur.

Melchior engraved other plates beside those for the *Iconographia* of Baur, of which the principal are, “The History of Ulysses,” from Theodore van Talden; some antique statues, executed entirely with the graver; and the portraits of Sebastianus Kirchmajerus, public professor at Ratibon, after Benj. Block, in 4to.; Johannes Hozius; Maximilianus Curz, dated 1658; and Antonius Schottius, dated 1680, all of the folio size.

Jeanne Sibelle Keefell, born at Augsberg in the year 1646, was the third daughter of Melchior, married Jean Ulrich Kraus, engraved, among other plates, a set of four, of the Satyr and Villagers, Juno, Venus, and Pallas, after Elshiemer, and died in her native city in 1717.

Jonas Umbach was also of Augsberg, born in the year 1624, and merits an high rank among the artists of Germany. His prints consist chiefly of etchings after his own designs, executed with spirit and an appearance of facility. He engraved one hundred and eleven plates, of which the following are the subjects of the principal, and died in his native city about the commencement of the seventeenth century. “A Madonna and Child.” “An Holy Family.” “A Penitent Magdalen,” and “St. Peter,” all of small dimensions. Four plates from “The Parable of the Good Samaritan.” Four ditto of “Infantile Sports.” A pair of “Triumphs of Marine Deities.” “A Family of Satyrs,” all of small sizes; and a set of four landscapes, adorned with ruins of ancient monuments and pastoral figures, dated 1678, in 4to. highly esteemed engravings.

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Ling-Bach, Backhuysen, and Jean Henry Roos, also performed some meritorious etchings in Germany about this time. The animals of the latter are much celebrated, and among his best plates may be reckoned a set of twelve, of "Domestic Animals," in 4to. A pair of "Grand Landscapes," adorned with cattle and ruined buildings, and "Un Berger endormi au pied, &c." He was born at Otterdorf, in the Palatinate, in 1631, and died at Frankfort in 1681, and his masters were Julian Jardeyn, and Adrian de Bie.

The family of the Wolfgangs contributed but little to the advancement of engraving; we therefore pass them briefly. George Andrea Wolfgang was originally a goldsmith and engraver on the precious metals, but afterwards studied engraving on copper under Matthew Keffel, and scraped some few mezzotintos. He was born at Chemnitz, in Saxony, A. D. 1631, and died at Augsburg in 1716. The best engravings of George Andrea are the portraits of George Frederic, margrave of Brandenburg, after C. Zierl, in folio, and Pierre Muller, Juriconsulti, in 4to. And, in history, "A Grand Sacrifice to Diana," after A. Schoenfeld, and "Saul consulting the Ghost of Samuel," after Jos. Werner, both of the folio size.

Andrea Matthew, the son of George Andrea Wolfgang, was born at Augsburg in the year 1662, and died in the same city in 1735. He studied the elements of design under the direction of his father; but embarking for England with his brother, presumptively at some port in the Mediterranean sea, they were intercepted by an Algerine corsair, and carried into captivity. On their liberation, which was in consequence of a ransom paid by their father, they both returned to Augsburg, where Andre Matthew settled, and began to engrave portraits: he also engraved a print of "The Court of Algiers," in which he has represented himself as a slave.

His best portraits are those of George Andre, his father, and Nicolaus Nuremberger, both in 4to., and in folio, John George Buttner, bishop of Frankfort, and Christopher Rad. In mezzotinto he has engraven Charles VI., king of the Romans. But, perhaps, his very best performance is a portrait of the margrave of Anspach.

His younger brother, Jean George Wolfgang, was born in 1664, received the same instructions as Andrea Matthien, and soon after their release from captivity travelled to Berlin, and in 1704 became engraver to the court. He engraved and published there a great number of portraits, among which that of the elector Frederick William, after Jacob's equestrian statue in bronze, is deservedly held in most esteem, though, in most of his portraits, the flesh is executed with delicacy, and Jean George is, on the whole, as an artist, the flower of the Wolfgang family. He died at Berlin in the year 1704.

Gustavus Andrea Wolfgang was the son of Andrea Matthien. He was born at Augsburg in the year 1692, and, after studying portrait engraving and miniature painting under his father for a time, followed his uncle to Berlin, where he remained for many years, but returned finally to his native country, where he died in the year 1766.

His best portraits, of which the flesh is engraved chiefly in dots, are those of M. Francois Reyter, admiral pour l'Armee navale Angloise en Afrique. Wolfgangus Jacobus Sulzer, Reipublicæ Augustanæ Decemvir, after G. Eichler, and Carl. Freyher von Stien; in small folio.

Jean Jacques Thurneyssen, or Thourneyssen, was born in the year 1636 at Basle, in Switzerland, and died in the same city in 1718. After having learned to draw in his own country, he went to Strasbourg to study engraving under Pierre Aubry, where he remained about three years, and removed successively to Lyons, and to the court of Turin.

In 1695, he returned to Vienna, accompanied by his sons; and his great merit, which was called by his rivals his superior fortune, obtained for him the patronage of the emperor Leopold. He was now the object of envy to the artists of Augsburg, where he continued to reside for some years; but as age approached, he wished to see again his native land, and departed for Basle in the year 1699, where, as we have already said, he finished his career.

Thourneyssen was a man of a robust frame, vigorous mental powers, and extreme professional assiduity. His mezzotint will be found in our third plate of those of the German school. Among the engravings he performed, those which are executed with a single stroke or spiral, in imitation of Mellan, have been most admired, though, perhaps, not most justly. He also occasionally imitated the square crossings of F. de Poilly.

His son, Jean Jacques the younger, worked in imitation of his father, but was less successful. The best engravings by Thourneyssen the elder are, the portraits of Laurentius Scotus, after Luc Damaret, dated 1661. Francois Turretin, after P. Haud. Petrus Werenfelsius, professor in the academy of Basle, after L. F. Wetstein, engraved of the folio size, (by the Thourneyssens, father and son,) in 1702.

Of his historical works, our allotted space only allows us to mention "The Virgin Mary, Infant Christ, and St. John," in a circle, after Carl. Dauphin, a folio plate, engraved in the fashionable style of Mellan. "An Infant Christ," after Blanchet, in 4to. "La Bilancia Politica del Boccacini." Two large folio plates of "Grand Thefes in Philosophy," in which whole length portraits of the princes palatine of Neubourg are introduced, and the statues of Laocoon, Antinous, and Latona, in the style of Mellan, for Sandrart's academy.

Francois Ertinger was born at Wyl, in Suabia, A. D. 1640, travelled to Italy for improvement, but died at Paris in the year 1700. As an engraver, neither his judgment nor his taste ranks very high; but the following list of his best works will shew that the subjects of his prints at least were sometimes wisely chosen.

A set of eight plates, after Rubens, from the History of Achilles. "The Marriage of Cana in Galilee," a large folio, after Raymond le Fagi. A set of ten, from the same master of the History of the Counts of Thoulouse. A large folio, of a Bacchanalian subject after N. Poussin; and the portraits of Nicholas Machiavel of Florence, the celebrated political philosopher, in 8vo. Gabriel de Pinaco, Jureconsulti; and Jean Ferdinand de Beughem, bishop of Auvers, after F. de Cock; both in folio.

Gerard Lairelle was born at Liege in the year 1640, and died at Amsterdam in 1711. He was instructed by his father, Regnier, in the rudiments of art. For an account of his merit as a painter, see the article LAIRESSE. He etched a vast number of plates, from his own compositions with great freedom, and the fearless hand of a painter who has other objects in view than the graces or blandishments of manual execution. His chiaroscuro is broad and powerful, and so contrived as to conduct the eye of a spectator at once to the principal objects in the composition.

The major part of his designs were engraven by himself, and, as Balaun observes, are highly esteemed by connoisseurs, and exceedingly useful to students in art.

The portrait of Lairelle, in folio, surrounded by emblematical ornaments, has been engraven by N. Visscher.

The most esteemed of his own engravings are, "The Sin of our first Parents," and "Adam and Eve expelled from Paradise," a pair in folio. A rich composition of

"Joseph

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“Joseph and his Brethren,” and another from the History of Solomon, both in large folio. “The Incredulity of St. Thomas;” and another in folio, from the Life of Christ, inscribed “Sapientia unigena Dei Maximi.” “St. Theresa in Extasy,” a large folio. “The parting of Hector and Andromache,” in folio. A rich composition of Marc Antony and Cleopatra, with the motto “quam Mars nunquam, vicit Venus.” A march of Amazons, inscribed “Virtus viri computa actionibus probis.” A grand Bacchanalian subject. “Venus lamenting Adonis.” A set of four plates of the seasons. “Diana and Endymion.” “Bacchus Silenus and Nymphs;” all of the folio dimensions: and three large allegorical subjects, in compliment to the prince of Orange.

The prints of Laireffe are generally inscribed with one or other of the four monograms which the reader will find in our third plate of those of the German engravers.

Samuel Bottschild was born at Sangerhausen, in Thuringia, A. D. 1640, and died at Dresden in 1707. He was an artist of taste; and, being possessed of elevated habits of thinking on professional subjects, he was appointed director of the Dresden academy, and inspector of the electoral gallery. His excellence in fresco painting is attested by his picture of “The Descent from the Cross,” in the church of St. Martin at Halberstadt, and by several paintings which adorn the castle gardens near Dresden; and his etchings are performed with much picturesque freedom: the general character of his art partaking much more of the grand than the graceful. His principal engravings are, “The Army of Sennacherib defeated by the exterminating Angel,” in folio. A set of four, entitled “Le Don de l’Entendement;” “Le Don de la Science;” “Le Don de la Sageffe;” “Le Don de la Force,” in 4to. A set of the four parts of the day, with Latin inscriptions. A pair of emblematical subjects, intitled “L’Esperance et la Patience;” “La Foi et la Charité,” ovals, in 4to. “Ulysses and Epius,” and a subject from the Life of Hercules, both of the folio size.

Elias Hainzelmann was born at Augsburg in the year 1640, and died in the same city in 1693. He studied engraving at Paris in the school of François de Poilly, whose style of manual execution he imitated with great success; and Strutt has well observed, that had his drawing been equally correct, his works would have ranked with those of the greatest masters. They possess, however, especially his portraits, a considerable share of merit.

From Hainzelmann’s historical works, the following will probably be found most worthy of selection: “The Silence,” after Annibal Caracci; so called, because, while the Infant Christ is sleeping, the Madonna holds up her finger to St. John, as he approaches, to prevent his disturbing the Saviour. This picture has since been engraved by others, but particularly by Bartolozzi in a very superior style. A large upright plate of an Holy Family, after Sebastian Bourdon; and two others lengthways, of the same subject, from the same painter, in one of which the infant St. John presents a lamb, and in the other an apple, to Jesus Christ. St. Francis, after Dominichino. “The noli me tangere,” or Christ in the garden, approached by Mary Magdalen, after Albano. “The Madonna and Child,” after Raphael. “Jesus Amabilis; Mater Amabilis; St. Regard;” all of the folio size.

His best portraits are those of Francis Xavier, of the fraternity of Jesuits; George Philip Rifs, after Ulric Mayr; Marcus Haberns, and Juliana Benedicta Winklerin, after the same. David Thoman ab Hagellstein, after de Neve; Agnes van Schoenberg; Godfried Eggerus; Gabriel Willer; John Jacob Haller, after D. Savoy, all in folio, and Johan Christoph. ab Adelmansfelden, after

C. C. Kretzschmann, in very large folio; the head, the size of real life.

Jean Ulric Kraus, or Krauffer, was born at Augsburg A. D. 1645, and died in the same city in 1719. He was the disciple of Melchior Kuffell, and married Jean Sybille his daughter, and became a close imitator of the works of his contemporary Le Clerc. But all followers are necessarily behind. Though Kraus copied Le Clerc’s life of Christ, (which consists of sixty subjects,) it is sufficiently obvious that they are but copies.

His engravings are numerous, chiefly from his own compositions, and the subjects of them, for the most part, views of buildings, or taken from the Old and New Testaments. In imitation of his model Le Clerc, he generally introduced a vast multitude of figures into his compositions, but they are less graceful, and far less well drawn. He frequently enriched his back grounds with architecture, which he appears to have well understood, and his chiaro-scuro is often judiciously disposed, and his general effects good.

The cypher with which Kraus usually marked his prints will be found in our third plate of German monograms, and the list of his principal works is as follows: a set of sixty subjects copied from Le Clerc’s life of Christ, on small folio plates, two subjects on each, printed at Augsburg 1705. The history of the Old and New Testaments, in 4to. containing four small subjects on each plate, and apparently designed to be bound in 8vo. so as to have two subjects only on a leaf. The number of leaves would then amount to one hundred and eighty-eight, and they are so numbered. The four seasons, and the four elements, designed for the royal tapestries. A set of twelve interesting views of the city of Nuremberg, after Andrea Graf, in folio, and a very large and capital view of St. Peter’s church at Rome, after the same master.

Carl Gustave d’Ambling, or ab Ambling, was born at Nuremberg A. D. 1651, and died at Munich in the year 1702. He studied under F. de Poilly at Paris, and imitated his style, but with no very great success. He was a painter as well as an engraver, but was chiefly engaged in engraving portraits. When he attempted history, neither his drawing of the naked, nor the expression of his heads is correct, and the general appearance of his prints is cold and metallic.

Yet the race is not always to the swift, nor the battle to the strong, and Ambling, notwithstanding these defects, obtained court patronage, and became engraver to the duke of Bavaria.

Of his numerous portraits, we shall only mention those of Maximilian Emanuel, electoral prince of Bavaria, after T. Macolinus Musicus, dated 1670, a rare print. Maximilian Emanuel, elector of Bavaria, after J. B. Champagne, both in folio, and the latter esteemed one of his very best performances. An equestrian statue, also of his patron, and Henrietta Maria Adelaide, duchess of Bavaria, after Delamonce, dated 1675, in an oval, and also of folio dimensions.

Of his historical works the principal are, a set of thirteen plates of different sizes, of the histories of the emperor Otho and Louis of Bavaria, from the tapestries in the castle of Munich, which were executed after P. Candido. Another set of nine in folio, from the same tapestries, representing personifications of the months September, October, and November, the four Seasons, Morning, and Night.

The family of Meyer flourished as artists, and chiefly as engravers, through two centuries. Joachim was born at Strasburg early in the sixteenth, and distinguished himself by engraving a set of sixty-two prints of combats with the sword.

Andrea was a native of Zurich, and engraved several views  
of



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of towns, to which he affixed one or the other of the singular monograms which will be found in our third plate of those of the German school of engravers.

Dirick was born in the same city, and of the same family, in the year 1571, and his principal work of engravings is a set of portraits of the illustrious persons of Switzerland.

Rodolph, and Conrad, Meyer were the sons of Dirick. The engravings of the former are chiefly portraits, with some few emblematical prints: he was tolerably successful, and marked his prints as may be seen in our plate of German monograms. He was born in the year 1605, and lived only to the age of thirty-three.

His younger brother Conrad was born in the year 1618, and died at Zurich, the city of his nativity, in 1689. He produced a considerable number of prints which were chiefly from his own designs, among which are the cuts for an edition of Erasmus's Praise of Folly. A set of five, which are termed a comparison of the present times with those of Noah and Lot. "The Deluge;" "The Last Judgment," and "Memento Mori." A set of fifteen for the Mirror of Christians. A set of cuts for a dance of Death, partly invented by himself, and partly by his brother Rodolph. And several sets of portraits of the burgomasters, reformers, and artists of Zurich.

Jean Meyer resided about the same time, or a little earlier, at Nuremberg, but is presumed by Strutt to have been of the same family as the preceding. He etched, among other plates, a set of battles in a slight but spirited style, from his own compositions.

Felix Meyer was more celebrated. He was born at Winterthur, in Switzerland, in the year 1653, and died at Weyden in 1713; his genius developed itself at Nuremberg, whilst studying under F. Ermels, a celebrated painter of landscape, to which he afterwards added the study of nature. His etchings are deservedly held in esteem among connoisseurs, for the freedom and intelligence which they display, combined with effective chiaroscuro. The most important of these are, a set of twelve, ornamented with ruined edifices and rocks, &c. Another set of four of the scenery of Switzerland, with ancient monuments and figures, dated 1701. Another set of four of the same kind of subjects, and another set of the same number, of a more wild, mountainous, and rocky character, all of the 4to. dimensions.

Joachim Francois Beisch, or Beich, was born at Munich in the year 1665, and died in the same city in 1748. He studied the principles of design under his father, who was a painter of Ravensburg, but domiciliated at Munich. They both painted landscape and battles, and Joachim travelled to Italy for improvement, where he resided for several years, contemplating the scenery of that classical landscape country, and the works of Gafpar Poullin and Salvator Rosa.

On his return to Munich, he took up the etching point with success, and produced several sets of plates of landscape scenery in a grand taste, among which the principal are, a set of eight mountainous landscapes from his own compositions, in 4to. Another set of six. Another set of six with rocks, cataracts, and banditti, in the style of Salvator Rosa, of the folio size.

George Philip Rugendas of Augsburg was born in the year 1656. He learned drawing of Isaac Fischer, but afterwards studied with more advantage from the works of Pietro Tempella, and Bourgognione. He travelled to Vienna, from thence to Venice, and from thence to Rome, where he remained a long time, and revisited Augsburg in the year 1695. At this time the war of the Spanish succession was raging in Germany, and our artist had opportunity to contemplate its effects, and draw battles, skirmishes,

and sieges, from nature. Among these the bombardment and taking of his native city by the French and Bavarians, formed an interesting subject for his pencil and etching needle, and he published in six prints, their military operations in that neighbourhood during the years 1703 and 1704.

Rugendas deservedly holds a distinguished rank among battle painters. His designs are at once bold and correct, his composition orderly, his pencil facile, and his colouring performed on principle; above all, the varied attitudes and graces of his cavalry are justly admired.

Besides the pictures from his hand, which are not uncommon in the galleries and cabinets of Germany, Rugendas has performed a considerable number of etchings and plates in mezzotinto, of which the subjects are chiefly hunting and battles; some by himself, and others in conjunction with his sons, of whom he had three that were educated to the arts.

We begin our list with a selection from his etchings: a set of six of "Capricci de Georgio Filippo Rugendas," dated 1698. Three sets of "Cavaliers Marching, in Action, &c." consisting of twenty-two plates, in 8vo. A set of six very capital etchings, in folio, of "Les Operations militaires de Francois et des Bavaois a Auglbourg et a ses Environs," dated 1704.

His best mezzotintos are, "A Colonel of Hussars on Horseback." A set of four, of "Combats between Hungarian and Prussian Hussars." A set of four, "Hunting Pieces." A set of four, "Battles, &c. in the Turkish Campaign." Another set of six, entitled "Les Operations et les Occupations militaires," &c. all in folio.

The following were produced in conjunction with his sons: A pair of "Mountainous Landscapes," in 4to. A pair of "Combats between Cavalry." A set of four, of "Marches and Halts." Another set of four, of "Camps and Skirmishes," all in 4to. A set of six, of "The Amusements of the Camp." Two sets of Battles, consisting of six in each. A set eight, of "Marches, Halts, and Combats of Cavalry," all in folio; and a set of twenty of various military subjects, in 4to.

Jaques Christophe le Blond, or Blon, an engraver in mezzotinto, was born at Frankfort in 1670. He travelled to Rome in the year 1696, in the suite of the imperial ambassador, where he studied painting under Carlo Maratti, but his genius being of a mechanical turn, he entered with warmth into various speculations: at length he learned to scrape mezzotinto, and discovered a method of printing mezzotinto plates in colours. The Dutch painter Overbeek persuaded him to bring his new discovery to Amsterdam, from whence he emigrated to England.

Eagerly bent on the execution of his new project, he executed in London several large plates in mezzotinto, from pictures by the greatest masters, and disposed of the prints by lottery: but those who obtained the prizes appear not to have held them in any very great estimation. He made known the manner in which he performed and printed these plates, in a book entitled "Coloritto, or the Harmony of Colours in Painting, reduced to mechanical practice, under easy precepts and infallible rules," which were printed both in English and French: but nothing is more common than the failure of *infallible* pretensions, and the spirit of fine art has always evaporated in the various attempts to reduce it to mechanical practice. Le Blond's project did not succeed.

He afterward set on foot a scheme for copying the Cartoons of Raphael in tapestry, and made drawings for that purpose; but though money was subscribed, houses built, and looms erected at the Mulberry-ground, near Chelsea, this project also failed, and poor le Blond, to the no small



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dissatisfaction of those who were engaged with him, was obliged to disappear. He died at Paris in the year 1740, in an hospital.

The mezzotints which he produced are not without a considerable share of merit; but in his colouring process he was not always equally successful. The present writer has seen some, which, in respect of colouring, may be called good, and others which can scarcely be esteemed as any thing better than bad. His colours are rarely vivid and fresh, but frequently flat and dirty, and his drawing of the naked is incorrect, especially in the extremities of his figures. On the whole, his portraits will probably be found to be his best performances, of which the principal, are those of king George II. in large folio, the size of life: his queen, as a companion print. The three children of king Charles I. after Vandeyck, in large folio. Carondelet, after Raphael. Sir Peter Paul Rubens, after Vandeyck. And a noble Venetian, with a pointed beard, after Titian, all in very large folio, the size of life.

The best of his historical works are, "St. Agnes and St. Cecilia," after Dominichino. "A Repose during the Flight into Egypt;" and a "Venus Couchant," both after Titian. "The Triumph of Galatea," after Carlo Maratti. "Cupid fashioning his Bow," after Corregio. "The Charity of Joseph," after C. Cignani. "Christ on the Mount of Olives," after Caracci. "Christ Entombed," after Titian. And an anonymous, but very fine "Magdalen," all of the folio size.

Martin Bernigeroth was born at Ramelsburg in the year 1670, and died at Leipzick in 1733. He produced a number of portraits which is surprising, and which were collected in nine port-folios in the ducal cabinet at Dresden, many of them being of folio dimensions. Yet Bernigeroth does not rise above mediocrity as an engraver.

Jean Martin Bernigeroth was the son and pupil of Martin. He was born at Leipzick in the year 1713, and died in the same city in 1767. He possessed about the same portion of talent with his father; his best work being a portrait of Jean Adolphus, duke of Saxe Weissenfeld, in folio, dated 1745, which scarcely rises above mediocrity.

Antoine Balthazar Koenig was born at Berlin in the year 1676, and died in the same city some time about 1740. His prints, of which the following portraits are those which are held in most esteem, are not without a certain portion of merit. Frederick William, king of Prussia, after Weidemann. Frederick baron de Derflinger, general of Prussian cavalry. Charles Gottfried Schrader, aulic counsellor to the king of Prussia. Alexander Hermann, Comte de Wartensteben, after Ant. Pesne, dated 1716. And the monument of Schrader, with a Latin inscription.

Christian Albert Wortmann was born in Pomerania some time about 1680. He went very young to Berlin, where he studied engraving under Wolfgang, and at the age of twenty-five was summoned to Cassel, where he became engraver to the landgrave of Hesse. From Cassel he went to Dresden, where he engraved several portraits, and among the rest his celebrated head of Christian Frederick Boetius. In the year 1727, Wortmann was called to the court of Peterburg, but the time and place of his death have not been recorded.

His principal engravings are the portraits of Ernest Louis, landgrave of Hesse Darmstadt. Christian Frederick Boetius. Joachimus Justus Breithaupt, doctor in theology, after J. A. Rudiger. Johan Samuel Drobisch. Hermann Joachim Hahn. Anna, empress of Russia, after L. Caravac. Alexis, son of Peter I.

In an age and country of low taste, an indifferent painter or engraver of portraits will find encouragement, though an

artist of no other description could find subsistence. Among the petty courts of the German electors, there was probably at this time very little taste, yet observation enough to discriminate between two or more set of features; and personal vanity and courtly pomp enough, to catch at the means of attaining a certain species of perishable popularity.

We have passed lightly over engravers of this inferior description, and some we have entirely omitted, as they contributed nothing toward the advancement of art, but rather perhaps retarded its advancement.

From these men of mediocrity, attention turns with pleasure to the contemplation of the extraordinary powers of Jacob, or Giacomo Frey. Frey was born at Lucerne in Switzerland, in the year 1681, and his life presents a curious instance of the indestructibility of genius, which it should seem that no rigour of adverse fortune can subdue, and no fire of intemperate passions can consume.

He was apprenticed to the trade of a cartwright, and in spite of his propensities towards the fine arts, was obliged to follow that trade till he attained the age of two and twenty, when he somehow or other made his way to Rome; but in quitting the peaceful and placid vale of Lucerne, he seems to have broken loose from all sober restraint, and on his arrival in Italy, his passions, which had hitherto been held in check, hurried him into every dangerous excess. Yet, as the same Po, which roars and riots down the Alps, winds afterward a stately river through the plains of Italy, so it was with our artist: when the ebullition of passion was over, he listened with delight to the advice of Arnold van Wirtenhout, and the instructions of Carlo Maratti, and from that period began to make surprising progress in the art of engraving.

A speech of Maratti to Giacomo Frey, which strongly marks his good sense and observation, has been recorded: "The engravers of history (said he) make too much use of the *burin*, and hence arises a certain harshness in the contours, from which, however, the best prints of Dorigny are comparatively free. I would advise you to familiarise yourself with the etching point, because it operates in a far more picturesque manner than the graver."

Frey followed this advice. Robert van Audenarde was at this time his fellow-disciple and liberal rival, but the rapid strides of our artist soon left him at an immense distance, though a man of ability. He drew with superior taste; had a fine eye for the harmony both of colours and chiaroscuro; etched with a degree of spirit and freedom, which have very rarely been attained; worked over and finished his etchings with the graver, at once with firmness and facility; incorporating the whole by means of such exquisite feeling of the merits of his original, that it has been emphatically said of his prints, that they appear rather printed than engraved. He was the Gerard Audran of Italy, and seemed only to differ from Audran himself, as Raphael, Guido, Dominichino, and Guerchino, (after whom his principal works are engraved,) differ from Le Brun. In short, his feeling for the peculiar excellencies of the first masters of the Italian schools was of the highest and purest kind; so that it may be said, almost without a metaphor, that in his engravings their forms appear revived by the spirit of Giacomo Frey. He died at Rome in the year 1752, the admiration of every intelligent artist, yet before he had received more than an earnest of the praises that are justly his due.

It is to be regretted, that when his plates, which were published by his son Philip, began to wear, they were injudiciously retouched, perhaps by Philip himself, who destroyed all his father's sweetness and harmonious mellowness; so that good impressions of the prints of Frey, in their ori-

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ginal plate, are now become rare, though they have not yet attained their intrinsic value.

We add a list of his principal works, almost every one of which merit a particular criticism, beginning with the historical subjects: "The Holy Family," after Raphael, engraved from the same picture as the print by Eulinek, and of the same folio size. "Aurora, with the Hours, preceding the Chariot of the Sun," a large folio, from Guido, which has also been engraven by Audenarde, the fellow-pupil of Frey, and by Passignani and others. "Bacchus consoling Ariadne, after the departure of Theseus," (companion to the former) after the same master. "The Communion of St. Jerome," a large upright folio, from Dominichino. "The Adoration of the Shepherds," of the same size and form, from Sebastian Conca. "A Saint kneeling, and an Angel shewing him a Picture of the Virgin and Child," after Carlo Maratti, inscribed "In conspectu Angelorum psalmam tibi." "The Virgin giving the Scapular to St. Simon Stock," a large upright, arched at the top, and inscribed "Ecce signum salutaris," after Sebastian Conca. "St. Francis de Paul restoring sight to a Child," a large upright, from B. Lamberti. A large upright, from Andrea Sacchi, wherein Ecclesiastics appear to be ascending to heaven. "St. Charles Borromeo obtaining from Heaven the cessation of the Plague," from Pietro da Cortona, both large upright folios. "A Repose," from Carlo Maratti, wherein St. Joseph is offering cherries to the Infant Christ. And "The Martyrdom of St. Andrew," from the same master; both middling sized uprights. "The Death of St. Petronilla," after Guercchino. "St. Paul and Ananias," after Pietro da Cortona, both in large folio. "The Rape of Europa," and "A Charity," both after Albano, and of the folio size. A symbolical subject, after Bianchi, inscribed "Congregavit de regionibus liberos." And "The Beatification of the Virgin Mary," after Caracci, both in large folio. An allegory, in honour of the church, after Carlo Maratti, inscribed "Custos Clementia mundi." "The Emperor Augustus shutting the Temple of Janus," after the same painter. "The Archangel Michael," and "The Conference of the Fathers of the Church, on the Subject of the Immaculate Conception," both in large folio, after Guido; the latter from the same original which has also been finely engraved by our own countryman Sharp. "The Death of St. Anna, and St. Romanus," both after Andrea del Sacchi, and the latter a very favourite print. And the four angles of the Church of St. Charles de Catenarius at Rome, representing the cardinal virtues; (viz. Fortitude, Prudence, Temperance, and Justice,) after Dominichino, large upright folios.

Frey also engraved portraits, of which the best are those of his friend Carlo Maratti, from a picture by himself. Pope Innocent XIII. after A. Massucci. Pope Benedict XIII. on horseback. Pope Gregory XIII. in a chair, after the marble of Camille Rusconi. Cardinal Hieronimus Picco de Mirandole, after Neilly. And Clementina, M. Britan. Fr. et Hib. Regina, from a picture by himself; all in large folio.

Elie Christopher Heifs, an engraver of very large, but not very good mezzotintos, was a native of Memmingen, in Suabia. He was educated to the arts by his father Jean Heifs, a painter of Memmingen, and died at Augsburg in the year 1731.

He produced a considerable number of plates, both in history and portrait, of which "The Salutation of the Virgin" is three feet one inch in height, by two feet two inches wide; and "a Crucifixion," from his hand, is of nearly the same dimensions.

Bernard Vogel was the coadjutor of Heifs, some of these very large plates being seraped by them in conjunction. He was a native of Nuremberg, born in 1683, but resided chiefly at Augsburg, where he espoused the daughter of Heifs. In the earlier part of his career, he produced some tolerably good portraits with the graver, but latterly engraved only in mezzotinto. He retired from Augsburg to his native city, probably after the death of his father-in-law, and died there in the year 1737, leaving behind him a son, Jean Christophe, who engraved several plates in mezzotinto, after Kupetzky.

The best works of Bernard Vogel are the portraits, performed with the graver, of Johan Michel Weickmann, after L. C. Eichler; Augustus Hermann Frankius, professor of theology; and Johannes Michael Welfer, senator of Nuremberg, after J. C. Hirschmann, all in folio.

The chief of his portraits in mezzotinto, are those of Johannes Kupetzky, painter, dated the year of our artist's death; Michael Gottfried Wittber, a celebrated surgeon, after Kupetzky; and George Bledinger, the painter, all in folio.

Christopher Vogel engraved, in the same manner, the portrait of his father, inscribed "Chalcographus Norimb."

Jean George Bergmuller was born at Dirckheim, in Bavaria, A. D. 1687, and died at Augsburg in 1762. He learned the rudiments of art under Andrea Wolf, of Munich, but afterwards studied with more advantage under Carlo Maratti. He painted successfully, both in oil and in fresco, and etched a great number of plates, in an able and masterly stile, which he afterwards finished with the graver. He was likewise the author of two works; one on the growth of man, which he called "Antropometria;" the other on mensuration and architecture, published 1752, and became director of the Academy of Arts, which was established at Augsburg. His son, Jean Baptiste, also followed the art of engraving with some success.

The best of Bergmuller's prints are those which follow: a set of four, of the Baptism, Transfiguration, Resurrection, and Ascension of Jesus Christ. "The Madonna and Child." "The Death of St. Joseph." "The Saviour on the Mount of Olives." "The Martyrdom of St. Catherine and St. Sebastian." "Justice, and Peace," inscribed "Justitia et Pax oboculatæ sunt." A set of the four seasons, dated 1730. Another set of four of the zodiacal signs.

Jean Daniel Herz, draughtsman and engraver in aquafortis, was born at Augsburg A. D. 1693, and died in the same city in 1754.

Herz was an artist of original powers, rich in composition, bold and rough in execution, but deficient in grace and harmony of parts. He was appointed director of the imperial academy of arts at Augsburg, and filled the office with credit; but an hereditary director of an academy, nature, and science, will not endure, and his son Daniel, to whom the directorship unfortunately devolved, soon made himself appear ridiculous in this situation, though he was a tolerably good knight of the holy Roman empire.

The style of execution of Herz the elder bears marks of great rapidity, and rapid he must have been, for his plates are numerous, and some of them of very large dimensions.

We have selected the following, as those which, on the whole, are most worthy of the portfolio of the connoisseur. "The Annunciation," richly composed, and in very large folio. "The Raising of the Cross." "The Assumption of the Virgin." "The Adoration of the Kings." "An Ecce Homo." "The Crucifixion." "The Death of Ananias." "The Dispute between St. Paul and the Philo-  
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sophers of Athens." And "The Judgment of Solomon;" all in very large folio. "The Coronation Procession of Queen Maria Therefa at Presbourg;" also of very large dimensions.

Jean Elie Ridinger, a very distinguished engraver of animals, was born at Ulm in the year 1695, and died at Augsburg in 1787. His father was a reputable drawing master, and from him our artist received his earliest instructions in the art. He afterwards studied painting under Christopher Reifsch, but as an engraver studied nature alone, and was one of her successful votaries. He formed a style of engraving animals for himself, which consist chiefly of etching, which is performed with characteristic freedom and firmness, tempered and harmonised, without being over laboured, with the graver. He appears to have studied in the wildest and most unfrequented recesses of the forests of Germany, and the back grounds of his savage animals are conceived and executed in a grand and masterly style, occasionally displaying all the wild vigour of luxuriant and uncontrolled vegetation, which can only be contemplated in the depths of untrodden forests, and occasionally in his dens of bears, tigers, lynxes, &c. the most barren and dismal rocky solitudes, inasmuch that the reflecting spectator is led to wonder, either at the bold truths and fertility of a daring imagination, or, if he believes that Ridinger has really visited such scenes, at the dangers he must have escaped.

Nor are his portraits of wild and ferocious animals, less than his landscape scenery, the result of vigorous observation, and extensive power over the instruments of his art. In tracing their habits and manners, he combined the exactitude of a naturalist with the talents of a consummate artist.

Several of Ridinger's prints may be called historical, being representations of chases which really took place in his time, and at which he must have been present, in the forests of Germany, with portraits of the animals that were killed or taken, and beneath these engravings there is generally a particular description, or history, of the chase, in the German language.

He did not, however, draw the human figure, nor that of the horse, with equal ability; and though his chiaroscuro be often effective, yet in many instances his lights are too much scattered. He worked from his own compositions, and sometimes painted, as well as engraved, a favourite subject, but his pictures are not common. The most esteemed of his numerous engravings are those which follow:

"The Terrestrial Paradise," a set of twelve large folio plates, in which are introduced, in an appropriate manner, all the various animals; the subjects are connected by means of the history of Adam and Eve. These are grand compositions, finely executed, and in England but rarely seen. A set of sixteen fables. A set of heads of wolves and foxes, finely executed. A set of four large upright folios, which by some are esteemed the masterpieces of Ridinger, and two of which, representing "Bears feasting on a Stag," and a haunt of "Wild Boars in a Forest," are more especially to be admired. A pair of "Stag-hunting" and "Bear-hunting," in large folio, both designed from nature. Another pair of hunting pieces, of "The large Wild Boar with double Tusks," and "The Stag in Rutting-time," dated 1755, and 1757, taken by the duke and dukes of Wirtemberg. A set of sixteen hunting pieces of the larger and smaller game, as practised in the different states of Germany, with German and French explanations beneath, rich and interesting compositions. A set of twelve plates of savage and carnivorous animals, all in large folio, and after his own designs.

Ridinger also engraved, with his usual ability, a lion-hunt, after Rubens.

The Preisslers were a numerous family of engravers, whom we shall pass with brief notices, as they rarely rose above mediocrity.

Jean Daniel Preissler, an engraver of portraits, was of Nuremberg, and lived at the close of the seventeenth and beginning of the eighteenth centuries. His son Jean Justin was born in the same city in the year 1694, and died there in 1771. He resided in Italy a considerable time, and became director of the Imperial academy of Augsburg. His most distinguished works are "The Apotheosis of Zeus;" A set of the four elements, after Edmond Boucheardon; and another set of the four parts of the day, all in folio. A set of fifty plates of the antique statues preserved at Rome, from drawings by Boucheardon; small uprights. The ceilings of the Jesuits' church at Antwerp, after Rubens, consisting of twenty small plates, exclusive of the portraits of Rubens and Vandyke.

George Martin Preissler, a younger brother of Jean Justin, was also of Nuremberg; he engraved, in the family style, a considerable number of portraits, and a set of twenty-one plates of statues, at Rome and at Florence, from drawings by his brother Jean Martin.

The engraving of Valentine Daniel, another son of Jean Daniel Preissler, was chiefly confined to book plates and portraits.

Jean Martin Preissler, the fourth son of Jean Daniel, travelled from Nuremberg to Rome for improvement, and became, on the whole, perhaps, the best engraver of the family. He accepted an invitation to Denmark, and was living in good repute at Copenhagen in the year 1770. His style is clear and neat, but deficient in vigour, and his best prints are: "Christ bearing his Cross," a large folio, from Paolo Veronese. "Semiramis, placing the Crown of Ninus upon her own Head," from Guido, a large folio, engraved with the former, for the Dresden gallery. "A Battle," from Parrocet, and a Bacchanalian subject, from Pierre, both in large folio.

Jean Alexander Thiele was born at Erfurth in the year 1695, and from the rank of a common soldier rose to be a distinguished engraver and painter of landscapes. A decided taste for this art, and some pictures of Agricola, which it was his good fortune to see and copy in dilemper, introduced him to the notice of that artist, by whose instructions he failed not to profit. He is believed to have been the first in Germany who attempted to paint landscape in crayons, which, though an ineligible mode of art, is a proof of his ingenuity; he afterwards acquired a knowledge of oil-painting under Menyoky, in which he gloried, and in which he excelled. His study was the romantic part of Saxony, and more especially the banks of the Elbe and the Sala. His etchings, of which the subjects of the principal are named below, are rude but masterly. The celebrated Dietrich studied under him at Dresden, where he left a son, and where he died in the year 1752.

A pair of mountainous landscapes, adorned with ruins of ancient buildings, dated 1725, in folio, and very rare; a pair of smaller landscapes, of more rustic character; a set of three mountainous landscapes; a landscape of grander character, adorned with ruined monuments of antiquity, in quarto; a pair of "The ancient Port or Mouth of the Elbe," drawn from nature, and dated 1742; a pair of views at Naumburg, all in quarto; a set of six of superior execution, from nature, including views of Pilmütz, Königstein, Muffen, and Dresden, dated 1726, in large folio.

Paul Troger was born at Zell, in the bishopric of Brixen, in the year 1695, and died at Vienna in 1777. He studied the rudiments of his profession in his birth-place, and afterwards

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travelled for improvement to Fium, in the bishopric of Trent, in order to avail himself of the instructions of D. J. Alberti, after which he went to Vienna, and soon became known by his prints, and by the pictures with which he adorned some of the churches of Austria. In etching, the touch of Troger is firm and precise, his figures are well designed, and his expression just. He became director of the Imperial academy of Vienna, and engraved in a good taste both historical subjects and landscapes, the latter of which he ornamented with figures, ruins, &c.

His best prints are two small Holy Families; "The Virgin and Child;" "St. Joseph caressing the Infant Christ;" "The Virgin in Grief, comforted by Angels;" in folio. Five small landscapes. And a pair of landscapes, in which ancient monuments are introduced, in quarto, dated 1724.

Jacob Maennl was born at Vienna in the year 1695, and died in the same city at an advanced age; and, according to the baron Heinnekin, was a mezzotinto engraver of considerable ability. He was employed by C. Lauch, inspector of the Imperial gallery at Vienna, to scrape that celebrated collection in mezzotinto, and had executed thirty-one of the plates, when the death of both the engraver and employer prevented the completion of their project.

Of these thirty-one prints, only eleven were ever made public; the rest are presumed to have been sold by the heirs of Maennl, and are now missing. At the head of the work is a portrait of the emperor Charles VI., and Heinnekin and Strutt have given lists of the subjects engraved.

Antoine Joseph Prenner, or Von Prenner, after the death of Lauch and Maennl, undertook, in concert with Stampart, Altamonti, Schmutzer and others, to recommence the work from the Imperial gallery, and after a considerable lapse of time produced

"Theatrum Artis pictoriæ, quo tabulæ depictæ quæ in Casarea Vindobonensi Pinacotheca servantur," &c. in four folio parts, or volumes, of which part one was published in 1728, part two in 1729, part three in 1731, and part four in 1733.

These four parts contain one hundred and sixty prints, which are surrounded by borders in a bad taste, and the work altogether is but of mediocral character. The best portraits by this artist are those of Jean Gottfried Auerbach, painter to the emperor Charles VI. and count d'Odt, governor of Vienna, both of the folio size.

Gaspar von Prenner, the son of Antoine Joseph, was also an engraver, who travelled to Italy for improvement, and was engaged in engraving the "Museum Florentinum." He also produced a set of forty-five etchings, neatly finished with the graver, of historical subjects from Taddeo Zuccherò, and other distinguished masters, dated 1746.

G. A. Muller was born at Vienna some time about the commencement of the eighteenth century, worked in a delicate style, and, in concert with the Schmutzers, produced Rubens's series of the history of Decius, of which Muller engraved two.

His other principal works are the portraits of Phillipe Louis, count de Sintzendorf, after M. Altomonte; Jacob van Schuppen, member of the academies of Paris and Vienna, after a picture by himself. "The two Children of Rubens at the age of adolescence," from a celebrated picture by that master, in the Lichtenstein gallery.

The brothers, Jean Adam, Joseph, and Andrea Schmutzer, were natives of Vienna, and born about the close of the seventeenth, and beginning of the eighteenth centuries. They died, the former in the year 1739, the two latter in 1740.

Their grandfather, a general in the Imperial service, lost much of his property by the accidents of war; and the infidelity of the tutor to whom he had entrusted the education of his son, reduced that son to grievous extremities, but his sufferings struck out a talent with which it now appeared that nature had endowed him. He acquired the art of engraving on iron and steel, and ornamented locks and firearms with much taste.

He brought up his sons, the brothers of whom we treat, to the profession of gun-engraving, which they quitted for the more elegant art of engraving on copper. Jean Adam was the eldest, but, in spite of application, could never attain to the eminence of Joseph and Andrea. He engraved, however, for the gallery of Vienna under Altomonte, and his best prints are the portraits of the three empresses Eleonora, Amelia, and Elizabeth.

Joseph and Andrea generally, if not always, worked in concert, and affixed their names, sometimes Joseph and Andrea, and at others Andrea and Joseph, Schmutzer, with brotherly alternation. Joseph possessed dexterity both in etching and re-entering with the graver, and Andrea possessed great facility in managing the tool, which was the necessary result of his being educated to engrave on steel, and to which he added a careful study of the works of Bolfwert, and Van Dalen. The best prints from the gravers of these brothers are the portraits of the emperor Charles VI. on foot, after M. de Meytens; the empress Elizabeth Christina, after J. G. Auerbach; Gustavus Adolphus, baron de Götter, Prussian minister of state; and Leymann, a librarian, or bookseller, of Vienna, all in folio, and the two latter, also after Auerbach. A pair of ancient temples, in large folio, decorated with statues and trophies, after Joseph Galli Bibiena.

But their most distinguished work is three folio plates, from Rubens's life of Decius, in the gallery of the prince of Lichtenstein.

Jacques Schmutzer was the son of Andrea, and had the misfortune to lose his father when he was seventeen years of age. By what further misfortune he came now to be so very poor as to be employed partly as a hatcher and partly as a shepherd is not known, but he was employed to watch sheep, sometimes in the fields, but more frequently when penned up for slaughter. The public drawing-school, however, was in the neighbourhood of the sheep-pens, and his love for art often induced him to confide his flock to some indolent comrade, whilst he stole away to draw with the students of the academy.

The celebrated medalist Matthew Donner, apprized of these circumstances, took some notice of the lad, and invited him home, but by some new accident or impulse, he now began to study architecture; which pursuit he did not afterwards renounce for the arts of design. He was employed for three years as an architect in Hungary, during which time he designed and painted and engraved historical subjects at his leisure hours, and on his return to Vienna, continued occasionally to practice architecture.

He had now the good fortune to become known to the baron de Kettler, a great patron and protector of art and arts, who, charmed with his essays in engraving, solicited the prince Kaunitz, and the empress queen, to send the young Schmutzer to Paris; his solicitations were attended to, and our young engraver was placed under the guidance of Wille; here he perfected himself in the art, and in the course of the four years he remained in that celebrated metropolis, learned to use the graver with masterly intelligence.

He was now recalled to Vienna, with high rank in his profession, and was named by Maria Theresa a Director of the academy.

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academy. He superintended the education of a great number of students in his mature age, and at the close of the last century, was as great at Vienna, as Wille in Paris.

The best of Schmutzer's engravings are the portraits of Don Emanuel, of the illustrious family of Desfalls, and Joseph von Sonnenfels, both small; Martin de Meytens, the celebrated painter, after a picture by himself, dated 1756; C. G. E. Deitricy, another celebrated artist, after the same, dated 1765; Joseph Wenceslaus, prince of Lichtenstein, after V. Vanti; the emperor Francis I., after von Liotard, dated 1769; the companion to which is the empress Maria Theresa; and two portraits of prince Kaunitz, one after J. Steiner, and the other after Hagenauer, dated 1786, in a circle; a much esteemed and rare piece of engraving.

The above are all in folio. We now proceed to select from his historical engravings, "Ulysses discovering Alectra and Andromache," after the prince of Saxe Tefchen, dedicated to madame the archduchess; "Mutius Scævola before Porfenna," from a picture by Rubens in the cabinet of the prince Kaunitz, dated 1778; "St. Gregory refusing to admit the emperor Theodosius into the Church," after the same master, both plates in folio, and of learned execution; "Venus rising from the Sea," from a picture by Rubens, in the gallery of count Schoenborn at Vienna, beautifully finished, and four large and interesting landscape views at Neuwaldeck and Dornbach, in which occurs the tomb of Rousseau, and the statues of the Gladiator and the god Mars.

George Frederic Schmidt was born at Berlin A. D. 1712, and died in the same city in 1775. Schmidt was declined by Fortune to be a tradesman, but the voice of Taste, (says Huber,) proclaimed him an artist. His perseverance, after various struggles, at length, surmounted the obstacles that opposed themselves to the gratification of his natural propensities, and he was admitted a student in the school of George Patel Busch at Berlin, from whence his ambition, rather than his purse, in the year 1736, carried him to Paris, where he frequented the school of Nicholas de Larmessin, who honestly and earnestly seconded the professional wishes of Schmidt, by imparting to his disciple all that it was possible to communicate of his knowledge of the art of engraving.

In the year 1742 he was admitted a member of the French academy of Arts, although (which at that time was an important exception) he was of the Protestant religion. At this time Schmidt, Priesler, and Wille (of whom the reader will find an account under *FRENCH School of Engravers*) were distinguished at Paris by their superior merit in engraving, and were bound together by the ties of friendship, while there reigned between them a noble professional emulation. Schmidt had recommended himself to the friendly regard of the celebrated Rigaud by the very fine portrait of P. Mignard, which he engraved for his reception into the Royal Academy, and Rigaud contributed to his spreading reputation, by seeking and obtaining for him such engagements as were analogous to his wishes and talents.

In two years, however, or a little more, he was summoned to Berlin, and nominated engraver royal, and in the year 1757 he was sent for to Petersburg by the empress Elizabeth, to engrave her portrait, which he executed (with many others, while he remained in Russia) to the great satisfaction, not only of the connoisseurs of the court, but of the best judges throughout the Russian empire.

On his return to Berlin, in 1762, he began to distinguish himself in a new career of engraving, by etching in a picturesque style after the works of Rembrandt, in which he imitated Rembrandt's own mode of execution, but generally hit in his plates to deeper tones.

The engravings of Schmidt amount in number to nearly two-hundred, beside the vignettes which he did for the works of the king of Prussia. Count Crayen published a catalogue raisonnée of the whole, from which we have thought the following most worthy of selection, as specimens of the various powers of our artist.

*Portraits performed chiefly with the Graver, and of folio dimensions.*—Constantine Searlatti, prince of Moldavia, a rare and fine print, dated 1738; Charles Gabriel de Tubieres de Caylus, bishop of Auxerre, after Fontaine; Louis de la Tour d'Auvergne comte d'Evreux, after H. Rigaud, dated 1742; Johannes Baptista Rosseau, after J. Aved, dated 1740; Charles de St. Albin, archbishop of Cambrai, after H. Rigaud, dated 1742; Maurice Quinten de la Tour, from a picture by himself, dated 1742; Jean Baptiste Silva, a celebrated physician, after Rigaud, dated 1742; Pierre Mignard, first painter to the French king, after his friend Hyacinthe Rigaud, engraved in 1744, for Schmidt's reception into the academy, a piece regarded by connoisseurs as a chef d'oeuvre of the masters, and the flesh of which is engraved in a style so soft and mellow, that it has been emphatically said to be rather painted than engraved. The four last are in large folio.

After his return from Paris to his native city, Schmidt engraved the portraits of Antony Pesne, first painter to the king of Prussia, and Samuel Baro liber de Cocceii, both in folio, dated 1751 and 1752, and reckoned among the best portraits from the graver of Schmidt.

Johannes Theodore Eller, aulic-counsellor, &c. after Pesne; and Louis Albertene de Brandt baron de Grapendorf, after le Sueur, are a very rare and beautiful pair of portraits of the folio size.

Among the best portraits which our artist engraved at Petersburg, are those of Michel de Woronzow, count of the Holy Roman empire, and Nicholas Esterhazy de Galantha, both in large folio, after L. Tocque, and dated 1758; Pierre Comte de Schuallow, grand-master of the Prussian artillery, from the life, and dated 1760; the empress Elizabeth of Russia, a whole length figure, with accompaniments of the imperial costume, after L. Tocque, which Huber calls a superb print, more especially for the execution of the accessory parts, it is dated in 1758; court Cyrillus de Rafumowky, after L. Tocque, and Jacobus Mounley, from a picture by Schmidt himself, dated 1762, are rare and beautiful, and M. de Katt, field marshal and minister of state to the king of Prussia; the last portrait from the graver of Schmidt, the head in which is by himself, but the rest finished by Bergere the elder.

Among his historical and fancy works, may be distinguished a pair of "The fair Greek," and "The amorous Turk," the two first plates which Schmidt engraved under Larmessin at Paris; "Tabagee Flamaude," &c. in folio, after Ostade, engraved in a style resembling that of Visscher, and dated 1757; "The Virgin Mary sitting with the Infants Christ and St. John," after Vandyke, dated 1773; "The Virgin at Prayers," after S. Ferrata; "The Presentation in the Temple," after Pietro Teita, for the Imperial gallery at Petersburg; "Alexander and Philip the Physician," after Annibal Carracci, engraved in imitation of the historical style of Gerard Audran, at Berlin 1769, and "Timocles justified by Alexander," companion to the above, and after the same painter, both in large folio.

*In imitation of the Taste of Rembrandt.*—A half length of a bearded old man with a feathered bonnet, designed by the engraver, and an old woman in profile, after Rembrandt, companion to the above; bust of an Oriental in the style of Calligione, dated 1750; bust of a young man in a Rembrandt

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brandt head-dress; an old man habited as a Persian, after Rembrandt; portrait of a young female, and portrait of a young signeur, from the same master; the Jewish bride, and the father of the Jewish bride, both after Rembrandt, and from the collection of the count de Kamki; the profiles of Salimbeni, and count Algarotti; the portrait of the engraver himself, inscribed "Georg Fridrick Schmidt; Konigll Preuss Hof. Kupferteicher Mitglied der Maler Academie zu Berlin & Paris." dated 1752.

His best historical works, in the taste of Rembrandt, are, "Jesus Christ presented to the People, and buffeted by the Soldiers," after Rembrandt, dated 1756. "The Refuscitation of the Daughter of Jairus," after Rembrandt, with a very fine chiaroscuro, dated 1767. "The presentation in the Temple," after Dietrich, companion to the above. "The Philosopher in his Grot," by some called Anchises taking refuge in his grotto during the sack of Troy, in the back-ground of which is a city in flames, after Rembrandt, and dated 1768. "The Repentance of St. Peter," after F. Bol. "Lot and his Daughters," after Rembrandt, from a picture in the possession of prince Henry of Prussia, to whom the print is dedicated, and the funeral monument of Sir Andrew Mitchell, knight of the Bath, and ambassador from the king of Great Britain, who died at Berlin in 1771; the two last are of folio dimensions.

Joseph Wagner was born A. D. 1706, at Thalendorf, on the lake of Constance, and died at Venice some time about the year 1780. He learned the art of design under J. Amiconi, whom he accompanied to England and to Italy, and, obedient to the advice of this master, he afterwards travelled to Paris, and studied engraving with very considerable success under Laurent Cars. In the year 1756 he settled at Venice; began to publish there the engravings of himself and pupils, and finally established a beneficial commerce with several parts of Europe. Among his disciples were Flipart, Berardi, and, above all, Bartolozzi, whose talents have done honour to his master, to himself, to Italy, and to England, and who still lives engraving in Portugal amid the din of arms.

The style of Wagner's engraving is particularly easy and engaging, and is in fine art, what in manners we term amiable. It is built on the firm foundation of found drawing; and partakes highly of the merits of Gerard Audran and Giacomo Frey. Like them he harmoniously mingled etching with the work of the graver and dry needle, and, like them, he evinced a high feeling of the merits of those masters after whom it was his fortune to engrave.

The elements of his style are, vigour tempered with mildness and suavity; hence he is delicately bold, and, without the least appearance of labour, produces, in his best works, an effect of finishing, which others labour after in vain, and which is more particularly observable and appropriate in infantile subjects, or where he has to touch the imagination with indelicate grace. In his figures of the Infant Saviour and St. John, where the characters in his original allowed him to be so, he is, indeed, the Flamingo of his art; though if living artists had found a place in our Cyclopaedia, that honour must rather have been awarded to the most distinguished of his pupils.

Wagner's first attempts in engraving are said to have been the portraits of the English princesses Anne, Amelia, and Caroline, daughters of George II. Of his other portraits, the most remarkable are, a pair in folio, whole length figures of the empress Anne of Russia, and Peter the Great, conducted by Minerva. The empress Elizabeth Petrowna, with a Russian inscription, and Farinelli crowned by the

Muse of Harmony; all in folio, and after his first master, Amiconi.

Among the most esteemed of his historical works are, "The Infant Christ asleep in a Landscape," a beautiful print. "The Education of the Virgin." "The Prophet Tiresias," inscribed "Tiresias triplex modo vix modo scemina vates;" all of the folio size, and after Amiconi. "The Holy Family," elevated on a pedestal, at the foot of which are other saints, after Paolo Veronese. "The Interview of Jacob and Rachel," after Lucca Giordano, engraved for the Dresden gallery. "Rebecca receiving the Presents," after the same master, and for the same work. "The Death of Abel," after B. Luti, in large folio. "St. Mary Magdalen," from the same master, and of the same dimensions. "The Virgin and Infant Christ," after Solimena. "The Assumption of the Virgin Mary," after Piazzetta. "St. John in the Desert," after Carlo Vanloo; all in large folio.

A set of large landscapes, ornamented with Italian pastoral figures, after Zucarelli, and executed with much taste, are by Wagner, in conjunction with Bartolozzi.

*GERMAN School of Music.* Though the language and national style of singing in Germany are much inferior to those of Italy, the instrumental music of that country is indisputably the first in the world. It is true that the violin is infinitely obliged to Corelli, Geminiani, Samis, Tartini, and Boccherini; but for symphonies, and the union of wind-instruments with those of the bow, the Italians have nothing at present, equal to the full pieces of the elder Stamitz, Vanhal, Haydn, and Mozart; nor on keyed-instruments have they any compositions equal to those of Emanuel Bach, Haydn, Mozart, and several other great clavessinists. And though the best German fingers are, in general, inferior to the *piazza*, or street fingers of Italy; yet Germany has, now and then, furnished a vocal performer equal to the best of Italy: such as Raaf, the Mingotti, the Taiber, the Tosi, Mara, &c.

M. Suard, ci-devant member de l'Academie Françoise, an extremely severe and fastidious critic of the dramatic music of Italy, and a determined Gluckist, begins a long article in the Encyclopédie Methodique on the history of music in Germany; but though the article consists of twelve quarto pages, only four or five of them are bestowed on German music in general, before the author allens to his hero Gluck, whose life he gives, and an ample list of his works, since he quitted the Italian style of composition for that of France. All this is minutely and ably done, and would be satisfactory to all musical readers, if the author's zeal for Gluck, and his style were not *exclusive*, and his censures so severe, of all that has been admired in Italy, both in composition and performance, by all the rest of Europe, except France. No vocal compositions but those of Gluck escape condemnation. Metastasio's dramas are not written to his mind. The composers are too florid, and the singing too important.

If M. Suard had confessed that the style of singing in France was bad, and that its native public fingers were unable to execute such songs as the great Italian masters have composed; and therefore that it was most prudent to have as little singing as possible; the airs very short and simple, no introductory symphonies, or ritornels to impede the progress of the drama; to set the poet above the composer, and the actor above the singer; with these concessions all Europe would have admitted his reasoning to be just; but when M. Suard insists on all Europe implicitly following the French model in musical dramas; that where great opera composers and refined singers abound, they are not to be employed,



ployed, but that the melo-drama, to render it interesting, should never admit an air superior to an elegant ballad, is what lovers of dramatic music, and judges of good composition and good singing, will never subscribe to.

But though M. Suard is so determined a foe to all opera music but that of Gluck, and singing, except that of the natives of his own country, when he speaks of the instrumental music of Germany, he is very just, and celebrates the schools of Vienna, Coblenz, Mannheim, Munich, and Stutgard; which have produced the Stamitzes, the Touchis, Canabichs, Schreoters, Haydns, and innumerable other symphonists, whose compositions are known to all lovers of music. All these different symphonists (says with great truth M. Suard) have a peculiar character and style of their own; yet, continues he, "it must be allowed that all give way to the inexhaustible Haydn for invention and originality. He unites all the resources of science to the charms of good taste: he is noble and gay, full of grace and force; simple with infinite variety; and unites to movements the most sweet and captivating in melody, the greatest orchestral effects."

This character is written with such truth, intelligence, and feeling, that we forgive the elegant and refined writer much of his bigotry for Gluck, and intolerance for all dramatic music, except that of France.

No praise is too strong for the instrumental music of Germany in general by the composers so justly celebrated by M. Suard; but when to these we join Emanuel Bach, and the admirable Mozart, and his scholar Beethoven, it seems as if instrumental music, at least, was arrived at its acme of perfection. This extensive empire has likewise produced maillers who have even equalled the most eminent Italian dramatic composers of the last century; such as Handel, Haffe, Graun, J. C. Bach, Mistlewece, Gleck, Naumann, &c. without mentioning the operas, oratorios, and masses of Haydn, and the dramatic music of Mozart, perhaps the best of its kind. So that Germany may be said frequently to vie with Italy itself in its own best style of composition.

GERMAN, in *Geography*, a township of America, in Fayette county, Pennsylvania; containing 1835 inhabitants.

GERMAN Flots, the chief and post-town of Herkemer county, in the state of New York, situated on the N. side of Mohawk river, opposite to Herkemer, and 24 miles E. of Whitestown; and containing 1637 inhabitants.

GERMAN Town, a town of New York, in Columbia county, containing 516 inhabitants.—Also, a town of Philadelphia county, in the state of Pennsylvania, seven miles N. of the city of Philadelphia. It is a corporation, consisting chiefly of High and Low Dutch, and contains about 350 houses, chiefly of stone, some of which are large and elegant, forming one street about two miles in length. The public buildings are a Presbyterian, German-Calvinist and Lutheran church, a Friends' meeting-house, and an academy. Here is a considerable manufacture of stockings, made of cotton, thread, and worsted. This is an ancient town, pleasantly situated, and by its vicinity to the metropolis, well adapted for manufactures. The principal congregation of the Mennonists, and the parent of that sect in America, subsists in this place. A severe battle was fought here between the English and Americans in October 1777.—Also, a post-town, and capital of Stokes county, N. Carolina, situated near the town fork of Dan river, and containing a court-house, gaol, and about 30 houses; 528 miles S.W. by S. of Philadelphia.—Also, the chief town of Hyde county, in Newbern district, N. Carolina.—Also, a town of

Bracken county, in Kentucky, containing 81 inhabitants.—Also, a town of the state of New Jersey; 17 miles W.S.W. of Morristown.

GERMANDER, in *Botany*. See *TEUCRIUM*.

GERMANDER, in the *Materia Medica*. The common germander, *teucrium chamaedrys*, *chamaedrys minor repens*, is a native of England, and flowers in June and July. The leaves and tops have a moderately bitter taste, accompanied with a weak aromatic flavour, diminished by drying the plant. They give out their virtues both to watery and spirituous menstrua. The chamaedrys has been chiefly esteemed in the character of a mild aperient and corroborant; it is recommended in uterine obstructions, intermitting fevers, and in the rheumatism and gout. The good effects of the chamaedrys in the latter disorder are recorded by different authors who have employed it in various forms and combinations, of which the celebrated antirheumatic or Portland powder, is an instance. According to Murray the virtues of this plant should be nearly allied to those of *Marubium*; and therefore it promises to be useful in asthmatic affections, coughs, and inflammations of the lungs. These virtues, however, are somewhat problematical.

The *Marum* germander, or Syrian herb mastic, *teucrium marum*, flowers from July till September. It is a native of Spain, and is said to grow plentifully also in Greece, Egypt, Crete, and Syria. It was first cultivated in England by Parkinson in 1640, and is now to be found in many of our gardens. The leaves and younger branches of *marum*, when recent, emit, on being rubbed between the fingers, a volatile aromatic smell, which excites sneezing, but to the taste they are bitterish, with a sensation of heat and burning. According to Lewis (*Mat. Med.*) it loses but little of its pungency by being dried; and gives out its active matter principally to water, and completely to rectified spirit. Distilled with the former, it yields a highly pungent, tubular, volatile, essential oil, similar to that of feurvy-grass, but less pure and of less perishable pungency. Rectified spirit carries off, in the inspissation of the spirituous tincture, a considerable share of the smell and pungency of the marum, but leaves much the greatest part concentrated in the extract; which, on being tasted, fills the mouth with a durable, penetrating, glowing warmth. Wedelius strongly recommends this plant as an important remedy in many diseases requiring medicines of a stimulant, aromatic, and deobstruent quality, and instances of its efficacious use have been adduced by Linnæus, Rosenstein, and Bergius. At present, however, marum is here chiefly used as an emollient, and is an ingredient in the "pulvis asari compositus" of the London Pharmacopœia. The dose of the powdered leaves is from a scruple to half a dram, which Murray advises to be given in wine.

The *water* germander, *teucrium scordium*, is a native of England, in marshy situations, and flowers in July and August. The leaves of *scordium* have a smell resembling that of garlic, whence its name; and to the taste they are bitterish, and slightly pungent. When moderately and newly dried, they give out, says Lewis, (*Mat. Med.*) their smell and taste both to water and to rectified spirit. In distillation their peculiar flavour arises with water, but the impregnation of the distilled fluid is not strong, nor could any essential oil be obtained on submitting to the operation several pounds of the herb. The ancients attributed to *scordium* a peculiar antiseptic and alexipharmic power, and it had for many ages the character of being remarkably efficacious in all putrid and putrid diseases. With this view it entered into the composition of several officinal medicines, that were supposed to be antidotes to various kinds of poisons and infections.

fections. But, notwithstanding this celebrity, it appears to be a very insignificant article of the *Materia Medica*, and is therefore very justly fallen into disuse. Bergius, however, states its virtue to be "antiputredinosa, tonica, diaphoretica, diuretica, resolvens;" and some others recommend it to be employed externally in antiseptic cataplasms and fomentations. Woodville *Mat. Bot.*

GERMANDER, *Rock.* See VERONICA.

GERMANEA, in *Botany*, named by Lamarck after Mous. de Saint-Germain, a great admirer and cultivator of plants. Lamarck *Dict.* v. 2. 690. *Illustr.* t. 514. *Juss.* 116. 449. See PLECTRANTHUS, which latter appellation, given by L'Heritier, who was partial neither to M. de Saint-Germain nor his admirers, has been universally adopted.

GERMANIA, in *Geography*, a post-town of Culpepper county, in Virginia; 82 miles from Washington.

GERMANICIA, in *Ancient Geography*, a town of Asia, situated on a plain between mount Taurus and mount Amanus, on the bank of a small river which ran into the Pyranus, W. of the town.

GERMANICOPOLIS, a town of Bithynia, near the Propontide, called by Phny Helgas and Boos-Cate—Also, a town of Paphlagonia, called *Gangra*.—Also, a town of Isauria.

GERMANICUS, CÆSAR, in *Biography*, grand-nephew of Augustus, nephew of Tiberius, and grandson of Livia. When Augustus adopted Tiberius, he obliged him to adopt Germanicus, who thus, according to the Roman law, stood in the filial relation to them both. Germanicus married Agrippina, grand-daughter of Augustus, a lady not more illustrious for her rank than her virtues, and he himself grew up in the general affection of the public, on account of the excellence of his temper, and the mildness of his disposition, and was denominated the "delight of the Roman people." Germanicus was very learned and eloquent, and, at an early age, he became illustrious in warfare, and was raised to the most important offices of the state. When Augustus died, he was engaged in a war in Germany, and the affection of the soldiers unanimously saluted him emperor. He refused the honour, and then appeased the tumult which his indifference to the rank had occasioned. He continued his exploits in Germany, and defeated the celebrated Arminius, and upon his return was rewarded with a triumph. The Germans fought with the greatest bravery, but were at length obliged to yield to superior discipline and generalship. The concluding battle was attended with great slaughter to the Germans, and gave the Roman commander occasion to raise a trophy with this inscription, "The nations between the Rhine and the Elbe subdued by the army of Tiberius Cæsar;" but this subjugation was only a temporary cessation of the contest, and, upon some disaster experienced by the Romans from the elements, the Germans renewed their attack, which afforded Germanicus an opportunity of acquiring new laurels, and he expected to have made an entire conquest of Germany, but the emperor, jealous of his successes, recalled him, with many compliments upon his past conduct, and the prospect of a second consulate. On his return he was honoured with another triumph, which was celebrated with extraordinary magnificence. That part of the spectacle which was most affecting to the Roman people, was the chariot of the victor, filled with his three sons and two daughters. Germanicus was soon sent into the East to quell some disturbances there: the powers entrusted to him on this occasion were very extensive, but the suspicious Tiberius had placed Piso as a spy and check on the illustrious general. Germanicus entered upon his second consulship, having the emperor for his colleague: he visited

Athens, and was received in that city with all the adulation usually practised by the inhabitants. He then sailed to Eubœa and Lesbos, thence he touched upon Thrace, and crossing into Asia, viewed the ruins of Troy, and consulted the oracle at Colophon. Piso hastily followed him, and after terrifying the Athenians with a severe harangue, and throwing out insinuations against Germanicus, embarked for Rhodes, where he would have perished had he not have been saved by the humane assistance of the prince, whom he overtook there. Germanicus now proceeded to execute his commission. He placed the crown on the head of Zeno, son of the king of Pontus, an ally of the Romans. He then reduced Cappadocia and other places to the state of Roman provinces, and in the ensuing year he made a progress into Egypt, and viewed every thing that was deserving of notice in the country, at the same time opening the public granaries to the people, who were suffering under a scarcity. Upon his return from Egypt to Syria, he found that Piso had abrogated every regulation which he had established among the legions, and in the cities, and his indignation at this behaviour widened the breach between them. At this time Germanicus was attacked with a disease which afterwards proved fatal, and which was imputed to the effects of poison, but some of our best historians, having impartially examined the collateral facts, do not think the evidence sufficient to justify the assertion. Germanicus himself had no doubt that he was the victim of the malignity of Piso, and, in his last moments, conjured his friends to prosecute with the utmost vigour the authors of his death. He died at Epidaphne, near Antioch, in the year 19, in the thirty-fourth year of his age. His death was the subject of universal lamentation at Rome. Every other concern was forgotten, and the people, without waiting for an order from the magistrates, forsook the forum, shut up their houses, and assumed every token of universal sorrow. A profusion of honours was decreed to his memory, and even foreign princes and nations joined their testimonies of esteem and regret. He had been highly esteemed not only for his military accomplishments, but also for his learning, humanity, and extensive benevolence. In the midst of war he devoted some moments to study, and he favoured the world with two Greek comedies, some epigrams, and a translation of Aratus in Latin verse. Tacitus, Suetonius, and Univer. Hist.

GERMANO, in *Geography*, a town of Naples, in Lavoro, containing four parishes, four convents, and about 800 persons. Near this place are the ruins of "Cassinum," destroyed by Theodoric, king of the Goths. The town is situated 43 miles N. N. W. of Naples. N. lat. 41° 33'. E. long. 13° 45'.—Also, a town of the duchy of Urbino; 13 miles E. N. E. of Urbino.—Also, a town of France, in the department of the Sesia, late in the lordship of Vercelli; four miles E. of St. Ja.—Also, a town on the W. coast of the island of Porto Rico. N. lat. 18 20'. W. long. 67° 40'.

GERMANS, so called from the name of their country, in *Eccelesiastical History*, one of the sects of rigid anabaptists into which the Flemings were divided; the other two being denominated Flandrians and Frieslanders. See FLEMINGIANS.

GERMANS, *St. of Germans*, in *Geography*, a borough town of Cornwall, England, was, during the Anglo-Saxon era, a bishop's see. In 981, the Cornish bishop removed his see from Bodmin to this place; but bishop Levinus translated it to Crediton, in Devonshire, in 1049. King Athelstan founded a priory for secular canons here; to which the cathedral buildings were annexed. Of these nothing remains

but the church, which is a curious and interesting specimen of ancient architecture. It consists of a nave, two aisles, and two towers at the western end. Between the latter is a large entrance door-way, with a semi-circular arch, consisting of several ornamented mouldings. Contiguous to the church is Port-Eliot, the seat of lord Eliot. St. Germans, as a borough, sends two members to parliament, both of whom are nominated and influenced by lord Eliot. A small market is held here weekly; and two fairs annually. The living is a curacy in the gift of the dean and canons of Windfor. The Rev. John Whitaker, author of "The History of Manchester," &c. has published two volumes, quarto, entitled "The ancient Cathedral of Cornwall, historically surveyed." This work contains many curious particulars respecting St. Germans; but the greater part is occupied by theoretical dissertations.

GERMANUS I. in *Biography*, was patriarch of Constantinople in the beginning of the eighth century. His father was basely murdered by the emperor Constantine Pagonatus, and himself, by the same authority, was deprived of his manhood. In 715, he was appointed to the bishopric of Cyzicum, and from that honour he was translated to the patriarchate of Constantinople. He was the chief opposer of the emperor Leo, when he issued his edict for prohibiting the worship of images; during four years the emperor bore with patience all the resistance made to his decree, till at length the people, irritated by his discourse, broke out in acts of rebellion; to quell these, Leo assembled a council at Constantinople in 730, by which the patriarch was degraded from his dignity, but permitted to retire to his paternal seat, where he spent the remainder of his days in peace and quietness. He died in 740, and was immediately elevated as a saint in the Greek and Latin churches, on account of his zeal and sufferings in defence of image worship. He was author of several treatises; one, entitled "De sex Synodis Oecumenicis," &c. has gone through many editions, but that by Le Moine in his "Varia Sacra," in 1685, is by much the best. He wrote "An Apology for St. Gregory Nyssen, in opposition to those who accused him of falling into the errors of Origen;" and divers others miscellaneous pieces which are inserted in the Collect. Concil. and in the Biblioth. Patr. Moreri.

GERMANUS II. was patriarch of Constantinople in the thirteenth century, to which honour he was appointed about the year 1222. In 1233, he held a synod at the city of Nice, where he had fixed the patriarchal residence. He was, on account of some misunderstanding, deposed from his dignity in the year 1240, but restored again just before his death, which happened in 1254. He was author of a work intended to illustrate the liturgy, and entitled "Rerum Ecclesiasticarum Theoria," and of numerous homilies, orations, sermons, epistles, decrees, &c.—There was a third Germanus, who was translated to the patriarchate of Constantinople, from the see of Adrianople in the year 1267, but who resigned his dignity within a few months after his election. Moreri.

GERMANY, in *Geography*, an extensive country of Europe, situated between 45° 4' and 54° 40' N lat. and between 6° 30' and 19° 52' E. long. comprises chiefly the present empire of Austria, except Hungary, the greatest part of the Prussian dominions, a part of Pomerania belonging to Sweden, the duchy of Holstein, belonging to Denmark, some parts of Holland, some of the French departments on the Rhine, and all the states of the new confederacy of the Rhine, with the formation of which it lost its existence as an empire.

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In ancient times Germany was inhabited by various nations, which the Romans, with whom they waged war for some centuries, considered as Gauls. Of these the Helvetii, Boji, Teutofugi, and Gothi (see *GOTHUS*, &c.), and the Teutones, who dwelt in the Sinus Godanus near the Cimabri, were among the first that crossed the Rhine, and applied to themselves the name of Germani, probably from the Teutonic word *Gier* or *Guer*, a sword, asserting, as it were, their quality of warriors. The word *Gueria*, *Guerri*: in the Italian and French, which is not of Latin origin, appears to confirm this etymology. (See the history of the ancient Germans in the sequel of this article.) It is also from the Teutones that, in the German language, the country is called *Teutschland*, and latterly *Deutschland*. (See *TEUTONES*.) The French gave it the name of *Allmagne* from the *Almanni*, one of the German nations. (See *ALMANNI*.) In the middle age the northern and north-eastern regions of Germany got an accession of population from the Vandals and Slavonians; and towards the end of the seventeenth century, some parts of Germany received an inconsiderable increase of inhabitants, by some thousands of French protestant refugees, who left France after the revocation of the edict of Nantes.

Busching stated the extent of Germany at 11,124 German square miles, 15 to a degree; but professor Crome of Gießen, including Silesia, states it at 12,796 German square miles, and its circumference at 500 German miles.

Germany is bounded on the north by the river Eider, and the canal of Holstein, which separate it from Denmark, and by the Baltic sea; on the east by Prussia, Poland, Hungary, Slavonia, and Croatia; on the south by the gulf of Venice, Italy, and Switzerland; and on the west by the Rhine and the North sea.

Maximilian, grandfather to Charles V., divided Germany into ten circles, and this division was confirmed in the diet of Nuremberg in 1552; but the circle of Burgundy, which contained the seventeen provinces of the Low Countries, having been detached from the empire, it latterly contained only nine circles, *viz.*

I. The *Circle of Austria*, which comprised, 1, the archduchy of Austria proper; 2, the duchy of Stiria; 3, the duchy of Carinthia; 4, the duchy of Carniola; 5, the Austrian Frioul; 6, the Littorale, or the territories of Triest and Fiume; 7, the county of Tyrol; 8, Upper Austria; 9, the bishopric of Trent; 10, the bishopric of Brixen; 11, the commanderies of the Teutonic order in Austria, and on the Etsch; and 12, the lordship Traup, belonging to the prince of Dietrichstein.

II. The *Circle of Westphalia*, which comprised, 1, the bishopric of Munster; 2, the bishopric of Osnabruck; 3, the bishopric of Paderborn; 4, the bishopric of Liège; 5, the abbey of Corvey; 6, that of Stablo and Mamecy; 7, that of Werden; 8, that of Cornelius Munster; 9, that of Essen; 10, that of Thoen; 11, that of Herorden; 12, the duchy of Cleves; 13, the duchy of Juliers; 14, the duchy of Berg; 15, the principality of Minden; 16, the principality of Verden; 17, the principality of Salina; 18, the principality of East Friesland; 19, the principality of Moers; 20, the duchy of Oldenburg; 21, the county of Mark; 22, the county of Ravensberg; 23, the county of Schauenburg; 24, the county of Lippe; 25, the county of Sternberg, which now belongs to Lippe; 26, the county of Bentheim; 27, the county of Steinfurt; 28, the counties of Tecklenburg and Lingen; 29, the county of Hoya; 30, the county of Diepholtz; 31, the county of Wied;

32, the county of Sayn; 33, that of Rietberg; 34, that of Pymont; 35, that of Gromfeld; 36, that of Kockheim; 37, the county of Anholt; 38, that of Holtzapfel; 39, that of Limburg in the county of Mark; 40, that of Blankenheim and Geroldstein; 41, the counties of Kerpen and Lommersum; 42, that of Schleiden; 43, the county of Hallermund; 44, that of Vinnenburg; 45, that of Spiegelberg; 46, the county of Fagnolles or Ligne; 47, the lordships of Gimborn and Neustadt, Winningen and Beilstein, Wittem, Eys and Schläcker. Geknen, Wickerad, Mylandonk and Reichenheim; 48, the free imperial cities of Cologne, Aix-la-Chapelle, and Dortmund.

III. The *Circle of the Lower Rhine*, or the electoral circle of the Rhine, which comprised, 1, the electorate of Mayence or Mentz; 2, the electorate of Trevis; 3, the electorate of Cologne; 4, the palatinate of the Rhine; 5, the principality of Arenberg; 6, the county of Lower Homburg; 7, the burgraviate of Rineck; 8, the county or lordship of Ballein; 9, the commandery of the Teutonic order Coblenze. The prince of Thurn and Taxis was a member of this circle, without having any territorial possessions in it.

IV. The *Circle of the Upper Rhine*, which comprised, 1, the bishopric of Worms; 2, the bishopric of Spire; 3, that of Straßbourg; 4, that of Bale or Basle; 5, that of Fulda; 6, the principality of Heiterheim; 7, the abbey of Prüm; 8, the abbey of Weissenburg; 9, that of Odenheim; 10, the landgraviate of Hesse; 11, the principality of Hersfeld; 12, the county of Katzenellenbogen; 13, the county of Hanau-Müntzenberg; 14, that of Hanau Lichtenberg; 15, the principality of Simmern; 16, the principality of Lautern; 17, that of Veldentz; 18, the principality of Deux Ponts; 19, the county of Sponheim; 20, the principality of Salm; 21, the principality of Nassau; 22, the principality of Waldeck; 23, the county of Solms; 24, the county of Königstein; 25, the county of Upper Homburg; 26, the possessions of the Wald or Wild, or Rau Graves and Rhine Graves, (in Latin, *Comites Saltuarii, Forestarii, Silvestres and Hirsuti*), counts of Grumbach, Stein, and Dhaun; 27, the county of Leiningen; 28, the county of Wittgenstein; 29, the county of Falkenstein; 30, that of Krichingen; 31, that of Wartenberg; 32, the lordships of Bretzenheim, Daackstul, and Ollbrück; 33, the free imperial cities of Worms, Spire, Frankfort on the Maine, Friedberg, and Wetzlar; 34, the imperial borough of Friedberg; 35, the imperial villages of Müntzfelden, Sultzbach, and Soden.

V. The *Circle of Suabia*, which comprised, 1, the bishopric of Constance; 2, the bishopric of Augsburg; 3, the abbey of Elwangen; 4, the abbey of Kempten; 5, the duchy of Wirtemberg and Teck; 6, the margraviate of Baden; 7, the principality of Hohenzellern; 8, the abbey of Lindau; 9, that of Buchau; 10, the principality of Furlenberg; 11, the county of Oettingen; 12, the principality of Klettgau; 13, the principality of Lichtenheim; 14, that of Friedberg-Scheer; 15, the abbey of Salmansweiler; 16, the abbey of Weingarten; 17, that of Ochsenhausen; 18, that of Eichingen; 19, that of Yrsee; 20, that of Ursperg; 21, that of Kayserheim; 22, that of Roggenburg; 23, that of Roth; 24, the abbey of Weissenau; 25, that of Schaffensried; 26, that of Marchthal; 27, the abbey of Peterhausen; 28, the abbey of Wetztenhausen; 29, that of Zwiefalten; 30, that of Gengenbach; 31, the abbey of Heggbach; 32, that of Gutenzell; 33, that of Rothmünster; 34, the abbey of Bandt; 35, that of Ebersheim; 36, the commandery of Alschhausen; 37, the

landgraviate of Stühlingen; 38, the landgraviate of Baar; 39, the county of Truchsets-Waldsburg; 40, the county of Königberg; 41, that of Oberstein; 42, that of Fugger; 43, that of Hohenembs; 44, that of Hohen-Geroldsteck; 45, the county of Neipperg; 46, the county of Bondorf; 47, the lordships of Wiefentleig, Haufen, Moeskirch, Tettwang and Argen, Mündelheim and Schwabeck, Gundelshagen, Jullingen, Eglof, Thannhausen, Egglingen; 48, the free imperial cities of Augsburg, Ulm, Essingen, Reutlingen, Nördlingen, Halle, Ueberlingen, Rothweil, Heilbronn, Gmünd, Munningen, Lindau, Dünkelsbühl, Biberach, Ravensburg, Kempten, Kaufbeuren, Weil, Wangen, Ysoi, Leutkirch, Wimpfen, Giengen, Pfüllendorf, Buchhorn, Aalen, Bopfingen, Buchau, Olfenburg, Gengenbach, Zell on the Haamerbach; 49, the imperial village of Aloehausen.

VI. The *Circle of Bavaria*, which comprised, 1, the archbishopric of Saltzburg; 2, the bishopric of Freylingen; 3, the bishopric of Ratibon; 4, the bishopric of Passau; 5, the principality of Berchtesgaden; 6, the abbey of St. Emmeran in Ratibon; 7, and those of Lower; and 8, of Upper Müntler in the same place; 9, the duchy of Bavaria; 10, the Upper Palatinate; 11, the principality of Neuburg; 12, the principality of Sultzbach; 13, the landgraviate of Leuchtenberg; 14, the principality of Sternlein; 15, the county of Haag; 16, the county of Ortenburg; 17, the lordships of Ehrenfels, Sultzburg, Pyrbaum, Hohenwaldek and Beitenek; 18, the free imperial city of Ratibon.

VII. The *Circle of Franconia*, which comprised, 1, the bishopric of Bamberg; 2, the bishopric of Würzburg; 3, the bishopric of Eichstaedt; 4, the commandery of the Teutonic order of Mergentheim; 5, the principality of Culmbach, or Bayreuth; 6, the principality of Onolzbach, or Anspach; 7, the principality of Henneberg; 8, that of Schwartzenberg; 9, the principality of Hohenlohe; 10, the county of Castell; 11, the county of Wertheim; 12, that of Rieneck; 13, that of Erbach; 14, the lordships of Limburg, Seinsheim, Reichelberg, Wiefentleid, Welzheim, and Haufen; 15, the free imperial cities of Nuremberg, Rothenburg, Windheim, Schweinfurt, and Weissenburg; 16, the imperial villages of Gochsheim and Sennfeld.

VIII. The *Circle of Upper Saxony*, which comprised, 1, the duchy of Pomerania; 2, the electorate of Brandenburg; 3, the electorate of Saxony; 4, the duchy of Saxe-Weimar; 5, the duchy of Saxe-Gotha; 6, that of Saxe-Cobourg; 7, that of Saxe-Meinungen; 8, that of Saxe-Hildburghausen; 9, the abbey of Merseburg; 10, the abbey of Naumburg-Zeitz; 11, the principality of Altenburg; 12, the principality of Querfurt; 13, the principality of Anhalt; 14, the abbey of Quedlinburg; 15, the abbey of Walkenried; 16, the principality of Schwartzburg; 17, the county of Mansfeld; 18, the county of Stollberg and Wernigerode; 19, the county of Barby; 20, that of Hohnstein; 21, the principality of Hatzfeld; 22, the county of Reufs; 23, the county of Schoenburg.

IX. The *Circle of Lower Saxony*, which comprised, 1, the bishopric of Hildesheim; 2, that of Lubeck; 3, the abbey of Gandersheim; 4, the duchy of Magdeburg; 5, the principality of Halberstadt; 6, the duchy of Bremen; 7, the principality of Celle; 8, the principality of Grubenhagen; 9, the principality of Calenberg; 10, the duchy of Saxe-Lauenburg; 11, the duchy of Wolfenbüttel; 12, the principality of Blankenburg; 13, the duchy of Holstein; 14, the duchy of Mecklenburg; 15, the

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the principality of Schwabia; 16, the principality of Ratzburg; 17, the county of Ranzau; 18, the free imperial cities of Lubeck, Goslar, Muhlhausen, Nordhausen, Hamburg, and Bremen.

The following countries, without forming part of any of the nine circles, were likewise considered as belonging to the German empire; *viz.* 1, the kingdom of Bohemia; 2, the margraviate of Moravia; 3, the margraviate of Upper Lusatia; 4, that of Lower Lusatia; 5, the duchy of Silesia; 6, the county of Montbelliard; 7, the three circles of the immediate Knights of the Empire, in Suabia, Franconia, and on the Rhine; 8, the lordships of Asch and Wasserburg, the convent of Schonthal, the burgraviate of Freudenberg, the barony of Horilgen, the abbey of Cappenberg, that of Elten, the lordship of Rheda, the abbey of Burfeleid, the lordship of Jever, the barony of Kniphhausen, the lordships of Dyk, Mechernich, Schonau, Wylre, Richold, Stein, Dreyfs, Landkron, Rhade, Saffenberg, Schaumburg, Oberstein, the county of Homburgh, and the barony of Schauen. The German empire had also several fiefs in Italy.

The climate and temperature of Germany must in general be acknowledged to be temperate, yet it is considerably milder in the southern than in the northern parts, where the winter is sometimes extremely severe, and of long duration. The air, however, is every where serene and healthy, except in a few low marshy places towards the North sea. The vine thrives, and yields excellent wine, in all the south-western parts. The salubrity of the climate may likewise be inferred from the longevity of the inhabitants, some of whom arrive to a very great age.

There is perhaps no country in Europe in which the soil varies more than in Germany. Sandy plains and barren heaths predominate in the north-east, and swamps and marshes in the north-west; but some of the interior and south-western parts are an uncommonly fertile soil, and great attention is generally paid to its improvement. The south and the south-east side is the most mountainous. Bohemia is separated from Silesia by the Rieser Geburge, or the Giants' mountains. Towards Hungary are the Carpathian mountains; towards Italy the Alps. In the interior parts are the Schwarzwald, (black forest,) the Rauhe Alb, the Ertzgeburge, the Fichtelberg, the Harz, or Hercynian forest, whose highest summit, the Broeken, is only 3580 feet above the level of the Mediterranean sea. In ancient times Germany was covered with forests, chiefly of oak, birch, pine, fir, larch, and ash trees. Though they have been considerably thinned, and immense tracts of them converted into tillage, there are yet some very large woods, as the Speßart, the Schwarzwald, the Hartzwald, and the Thuringerwald.

The extent of sea-coast on the North sea is not much above 150 English miles, and on the Baltic about 500 English miles. The principal lakes are the Boden see, or lake of Constance, in Swabia, which forms one of the boundaries towards Switzerland; the Chiem see, in Bavaria; the Girtzner see, in Austria; the lakes of Damm, Neuwarp, Madue, and Wilm, in Pomerania; those of Werbellin, Uckersee, Parstein, Schwieluch and Ruppin, in Brandenburg; the Dammer see, in the county of Diepholtz, besides several smaller ones in Mecklenburg and other parts of the country.

But it is chiefly the great number of rivers, by which Germany is intersected in various directions, that give it immense advantages for trade. It counts five hundred and twenty rivers in all; sixty navigable to a great length, and six, *viz.* the Danube, the Rhine, the Mayne, the Weser, the Elbe,

and the Oder, ranking among the largest and most noble rivers of Europe.

The number of mineral springs and baths exceeds one thousand; the most famous are Carlsbad and Egra, in Bohemia; Warmbrunn, in Silesia; Toplitz, in Austria; Heilbrunn, in Bavaria; Wisbaden and Seltzer, in the circle of the Upper Rhine; Freyenwalde, in Brandenburg; Dobberan, in Mecklenburg; Lanchstedt, in Saxony; and Pymont, in Westphalia.

As almost all climates, or at least all temperatures and soils, are to be met with in Germany, it abounds in almost all productions of nature and their varieties, and chiefly in all kinds of corn: flax of excellent quality, hemp, hops, tobacco, madders, saffron, rape-seed, rhubarb, excellent garden vegetables and orchard fruits; wine, in greatest perfection on the banks of the Rhine, Mayne, Moselle, and Neckar. The agriculture of Germany has been considerably improved of late by the efforts of Mr. Thaër and other patriotic writers. In the rearing of cattle and sheep Germany is, however, greatly deficient. The breed of horses, except in Mecklenburg, East Friesland, Oldenburg, Holstein, and some parts of Hanover and Wirtemberg, is very indifferent. The number of oxen is not sufficient either for agricultural purposes or for consumption. The best breed is in East Friesland, Oldenburg, and Holstein. The number of sheep does not exceed thirteen or fourteen millions. The Spanish breed has been naturalized in some parts of the Prussian and Saxon dominions. The breed of hogs is much neglected; that of goats is encouraged in the mountainous parts, where they also rear asses and mules. The forests are stocked with wild boars, stags, deer, and hares. Poultry is abundant. Salted and smoked geese, and goose-quills, are exported from Mecklenburg and Pomerania. Some parts of Germany are remarkable for fine larks and thrushes, of a delicious flavour. Others abound with singing birds, particularly Canary birds and goldfinches, which are exported to almost every country of Europe. Bees are less attended to than in ancient times. Silkworms are reared with particular care in some of the southern, and even northern districts.

Of the mineral productions of Germany, gold forms the most inconsiderable part, small particles of it are found in the Rhine, the Danube, the Elbe, and the Saale. Silver is more plentiful; its annual produce exceeds 200,000 marks, that of copper amounts to 100,000 cwts. The supply of tin from the mines is sufficient for home consumption. Iron of a very good quality, lead, quicksilver, cobalt, arsenic, and zinc are in great abundance. Besides topazes, amethysts, cornelians, agate, serpentine, and other rare stones, Germany has large quarries of curious marble, and capital mill and burr stones. It abounds with various sorts of fine earth, such as tripoli and porcelain earth, chiefly in the circle of Misnia in the kingdom of Saxony; terra sigillata, potters' clay, fullers' earth, and others. There are some coal mines, particularly in Westphalia, and abundance of peat moss. Salt is obtained in seventy-six salt works, of which those near Halle, in the former duchy of Magdeburg, produce the greatest quantity. There is no rock salt in Germany.

The principal manufactures of Germany are those of linen and woollen cloth, cotton, thread lace, china, hardware inferior to none but the English, glass, tobacco and snuff, writing paper, soap, wax, toys and trinkets, and silks, but not equal to the French. Manufactures flourish most in the Austrian and Prussian dominions, in Saxony, in the present kingdom of Westphalia, in the grand duchy of Berg, &c. The towns most remarkable for extensive manufactures are Altona, Augsburg, Berlin, Bronsvick, Bremen, Cassel,

Chemnitz, Dessau, Dresden, Eisenach, Erfurt, Erlangen, Frankfurt on the Mayne, Gohlitz, Gottingen, Gotha, Hamburgh, Hanau, Hanover, Herrnhuth, Hof, Leipzick, Lubeck, Mannheim, Meissen, Neustadt on the Dosse, Neuwid, Nurnberg, Offenbach, Plauen, Quedlinburgh, Stutgard, Ulm, and Zwickau.

Situated almost in the centre of Europe, bounded by the Baltic and North sea, and intersected by many large rivers, Germany has enjoyed, till very lately, a most extensive commerce. Its principal sea ports are Hamburgh, Altona, Kiel, Lubeck, Wismar, Roslock, Stralsund, Stettin, Emden, Bremen. Inland towns of great trade are Bronsvick, Magdeburg, Leipzick, Naumburg, Frankfurt on the Mayne, and Frankfurt on the Oder, Vienna, Augsburg, Nurnberg, Breslau, and Ulm. The principal articles of exportation are timber, corn, fruit, wine, tobacco, saddlers, cobalt, smalts, potash, horses, oxen, salt and smoked meat, butter, cheese, honey, wax, leather, wool, cotton yarn, linen cloth to the amount of six millions sterling, linen yarn, thread lace, cotton stuffs, hardware, lead, copper, brassy, quicksilver, china, earthen-ware, mirrors, glass, wooden toys and trinkets, &c. Germany imports corn, oxen, and horses chiefly from Hungary, Poland, and Denmark, hogs from Hungary, butter from Ireland and Holland, silk and cotton, all sorts of colonial produce, wine and fruit, silk and cotton stuffs, paper, jewellery and trinkets. It carries on a most important trade with European Turkey, from whence it gets by land as far as Semlin, and from thence upon the Danube by way of Vienna, an immense quantity of raw cotton, which is distributed all over the north of Europe, Germany and Switzerland. As it has to pay annually from three to four millions of piasters in hard cash to the Turks, these money transactions are carried on by means of the bankers of Vienna. The principal insurance companies are at Hamburgh, Lubeck, and Bremen. Weights, measures, and coins differed in every petty principality of Germany, and this circumstance was one of the disadvantages which travellers at least experienced from that number of free cities and small states for which Germany was particularly remarkable. It is true, as has been justly observed by the intelligent author of an essay on the Reformation of Luther, that all these cities and principalities of moderate extent had their principle of life active, peculiar, and independent. Each prided itself on making industry, sciences and arts flourish in its little capital.

By the treaties of Passau in 1552, of Augsburch in 1555, and of Munster in 1648, the Roman Catholic, Lutheran, and reformed religion, were acknowledged as dominant in Germany: but all other sects enjoyed a complete toleration, and the number of Jews in some parts is very considerable.

According to Mr. Charles Villier's view of the present state of ancient literature and history in Germany, in his report to the third class of the French institute, the German literati possess a great facility in entering into the spirit of nations and of ages, different from those of the present day, and are eminently successful in archeological researches, and in the interpretation and translation of the ancients, particularly of the Greeks, perhaps on account of some secret affinity between the two nations, as the analogy of the two languages seems to indicate. But if any species of literary production can be said to belong to Germany, almost exclusively, it is the history of literature. The German literary and critical journals, especially those published at Jena, Halle, Leipzick, and Gottingen, rank among the best in Europe. Before the revolutionary wars, the number of authors exceeded 7000. Their literary productions found a ready market at the two fairs of Leipzick in the spring and autumn of every year. The number of new books published at those fairs

was rarely under 4000: but since the fall of Prussia, in 1807, it has never exceeded 1500. Two hundred German, and about thirty foreign booksellers, used to meet at Leipzick, to barter their respective publications; the amount of these exchanges was generally above 200,000*l.* sterling. Anciently German authors wrote most of their works in Latin. In the beginning of the seventeenth century, there were at least 400 out of 700 written in that language; towards the end of the eighteenth century the proportion was only 200 in 2000. Before that period the literary labours of the Germans were confined to theology, jurisprudence, and biblical and classical criticism: but during the latter half of the last century they have been extended to every branch of science and literature; mineralogy, natural history in general, chemistry, astronomy, and geometry have been cultivated with an intelligent ardour and perseverance that have been rewarded with many brilliant discoveries. Statistics, which elucidates the theoretical tenets of political economy, and furnishes important materials to the historian and the geographer, is indebted alike for its origin and its improvement to the literary industry of the Germans. In metaphysics they have incurred the reproach of dogmatical obscurity, and in their dramas and novels they are justly accused of a disgusting affectation of morbid sentimentality. But their epic and tragic poets, and their moral philosophers, have immortalized themselves by works, which have been eagerly translated into all the idioms of modern Europe. To the great names of Luther, Kepler, Leibnitz, Haller, Euler, Mosheim, Puffendorff, Pott, Margraff, Hagedorn, Lessing, Gleim, Kleist, Heyne, Rabener, Klopstock, Ramler, Geffner, who live in the records of literary fame, must be added those of Bernouilli, Lambert, Kestner, Wieland, Schiller, Goethe, Herder, Zollikofer, Spalding, Bloch, Moses Mendelssohn, Klaproth, von Humboldt, Voss, Hölty, Michaelis, J. A. Eberhard, Von Zach, and many others, whose merits are as conspicuous as they are generally acknowledged.

The German language is of Teutonic origin, and may be regarded as a primitive one, as it is the mother tongue of the Dutch, Flemish, Danish, Swedish, and English languages. Its dominion extends from the boundaries of Lapland and Finland, to those of France and Italy. In the middle ages, the similarity between the idioms derived from the German was so great, that the German and English missionaries that went to Sweden, Denmark, and Norway, had no difficulty in making themselves understood in those countries. The learned Ihre, in his introduction to his Sueso-Gothic Glossary, has also discovered a striking conformity between the old Teutonic and Persian languages. That which it bears to the Greek in its construction is not less striking. The dialect known by the name of Low German, or Low Dutch, is now disused in writing, and wholly confined to the vulgar in the kingdom of Westphalia, in the duchies of Mecklenburgh and Holstein, and in Pomerania; it comes very near the Dutch. The High German, or High Dutch, has been considerably improved since Luther's time; it is remarkable for strength, richness, bold inversions, and compound words, which render it admirably fit for the higher strains of epic poetry. The learned dictionaries of Adlung, Eberhard, and Campe, have served to elucidate the meaning of every one of its terms, so that it may now be considered as fixed. It is spoken in its greatest purity in Upper Saxony, part of Lower Saxony, and on the banks of the Necker and the Mayne. There are still some traces of the Slavonian language left on the shores of the Baltic, in some districts of Pomerania, in Silesia, Bohemia, and Moravia: but it is disappearing very fast.



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No country can boast of more and better institutions for the acquisition of knowledge and science than Germany. Notwithstanding the great extent of territory ceded to France, there are still 30 universities, of which 17 are Protestant, 11 Catholic, and two mixed, *viz.*: Griefswalde, Jena, Leipzick, Wittenberg, Gottingen, Halle, Helmstädt, Kiel, Rostock, Altdorf, Erlangen, Rinteln, Gießen, Marburg, Stuttgart, Tubingen, Frankfort on the Oder, are Protestant universities; Bamberg, Wüztzburgh, Paderborn, Fulda, Dillingen, Freyburg, Inspruck, Vienna, Ingölsbad, Saltzburgh, and Prague, are Catholic universities; and the two mixed ones are Erfurt and Heidelberg. The oldest of them is that of Prague, which was founded in 1348, and the most modern that of Erlangen, founded in 1743. Most of these learned seminaries, which have furnished the northern regions of Europe with able teachers, are provided with extensive libraries, anatomical theatres, museums of natural history, botanic gardens, and astronomical observatories. The professors are animated with the noble ambition of extending the fame of the university in which they teach by their writings, and as the students pay a liberal fee for their lectures, this opens an honourable and useful competition among the teachers. Every student is at liberty to select what lectures he chuses to hear, and may employ his time as he likes. He has only a severe examination to undergo when he offers himself as a candidate for any situation in the law, administration, or church, or when he wants to take his degree as a doctor in medicine, without which degree he cannot be admitted into any college of physicians. All the other useless scholastic formalities have long since been abrogated.

Besides these universities there is a great number of public or free grammar schools, lyceums, and other learned schools in Germany. The methods of teaching have been considerably improved within the latter half of the eighteenth century, when Basedow, profiting by the hints thrown out by J. J. Rousseau, opened the Philantropinum at Dessau, and set an example of liberal and scientific education, which was soon imitated by men of enlightened views and extensive information. Campe, Villaume, Saltzmann, Trapp, and latterly Pestalozzi, have eminently contributed to introduce better modes of instruction. There are also many establishments destined to train young men for particular employments, such as military, mineral, commercial, and even agricultural schools. Females are mostly educated at home under the eyes of their mothers, who are particularly anxious to guard their daughters against the baneful influence of ladies boarding schools.

The numerous literary societies of all kinds, public libraries, reading clubs, circulating libraries, critical journals, and other means of disseminating and preserving knowledge, afford another proof of the high state of civilization to which most countries of Germany are arrived. The most distinguished of its learned societies are the imperial academy of natural philosophy at Vienna, the royal academy at Berlin, the academies at Cassel, Erfurt, Gottingen, Manheim, München; the agricultural societies at Heidelberg, Leipzick and Zelle. The best public libraries are those of Berlin, Dresden, Gottingen, Gotha, Hanover, Leipzick, Manheim, Stuttgart, Weimar, Vienna, and Wolfenbittel. Though Germany may boast of being the cradle of the art of printing, England and France bear the palm. The generality of German books are printed without taste, with bad types, and on bad paper. A few splendid editions have, however, been attempted at Leipzick, and met with merited success. The liberty of the press, which was never general all over Germany, has received its death-blow from the sway which the

French government exercises in every one of its counties, since the peace of Tillit.

Of the fine arts, music is that in which the Germans excel. They vie with the Italians, and the names of Handel, Bach, Haydn, and Mozart are revered by their rivals. Germany has also produced some good painters and engravers, but few statuaries and architects. With respect to dancing, it is far behind Italy and France. The principal academies for the encouragement of the fine arts are at Berlin, Dresden, Leipzick, Manheim, and Vienna. The most celebrated galleries of pictures are at Dresden, Vienna, Sans Souci, near Potsdam, Düsseldorf, Manheim, and Cassel.

The influence of the arts on the manners of a people is no where more striking than in Germany, where concerts and musical parties, together with dancing, form the chief amusement; and the manners of the middle orders are polite and affable.

Before the peace of Lunéville in 1801, the population of Germany was rated at 27 millions of inhabitants; but as it lost 3,700,000 individuals, through the cession of the countries situated on the left shore of the Rhine, its present population is very little above 23 millions.

The history of Germany in its ancient state, its gradual advancement towards extent of territory and dominion, and its recent decline and fall, presents to our notice a subject that is in a variety of respects peculiarly interesting. The western monarchy of Rome was first resisted, then invaded, and at length overthrown by the warlike inhabitants of Germany; and it was from the woods of this country that the most civilized nations of Europe issued; and we may still distinguish in the rude institutions of these barbarians the original principles of our laws and manners. Ancient Germany, excluding from its independent limits the provinces westward of the Rhine which had submitted to the Roman yoke, extended itself over a third part of Europe. Almost the whole of modern Germany, Denmark, Norway, Sweden, Friesland, Livonia, Prussia, and the greater part of Poland, were peopled by the various tribes of one great nation, whose complexion, manners, and language denoted a common origin, and preserved a striking resemblance. On the west, ancient Germany was divided by the Rhine from the Gallic, and on the south by the Danube, from the Illyrian provinces of the empire. A ridge of hills, rising from the Danube, and called the Carpathian mountains, covered Germany on the side of Dacia or Hungary. The eastern frontier was faintly marked by the mutual fears of the Germans and the Sarmatians, and was often confounded by the mixture of warriors, and confederating tribes of the two nations. Such was also the case with respect to the Gauls on the west, where it is not more difficult to fix their boundaries on account of their constant fluctuation. In the remote darkness of the north, the ancients imperfectly defended a frozen ocean, that lay beyond the Baltic sea, and beyond the peninsula, or islands of Scandinavia. But their nearest northern limit was the Hercynian forest, at that time supposed to be impenetrable. It appears from authentic documents that the climate of ancient Germany was much colder than that of the country in its more modern state. For the evidence of the fact, and the explication of it, we refer to the article CLIMATE, where the reader will also find some reflections on the influence which variety of climates is supposed to have on the minds and bodies of the different inhabitants of the globe. The keen air of Germany contributed, without doubt, towards forming the large and masculine limbs of the natives, who were, in general, of a more lofty stature than the people of the south, gave them a kind of strength better adapted to violent exertions than to patient labour, and inspired them

with

with constitutional bravery, which is the result of nerves and spirits. "In hos artus," (says Tacitus, *Germania*, iii. 20.) "in hæc corpora, quæ miramur, exerefeunt." The feverity of a winter campaign, that chilled the courage of the Roman troops, was fearfully felt by those hardy children of the north, who, in their turn, were unable to resist the summer heats, and dissolved away in languor and sickness, under the beams of an Italian sun.

As to the origin of the Germans, although we cannot allow with Tacitus, that they were "Indigenæ," or natives of the soil, yet we must admit that ancient Germany was not peopled by any foreign colonies, already formed into a political society; but the name and nation received their existence, as we have already observed in the beginning of this article, from the gradual union of some wandering barbarians, probably of the same nation with the Celts and Gauls, and both, perhaps, descended from the ancient Gomerians, or descendants of Gomer, the eldest son of Japhet. (See *DISPERSION of Mankind*.) The Germans, however, were very much intermixed with the old Scythians and Sarmatians, on that side which joined their territories, and particularly between the two great rivers, Rhine and Danube; and they, without doubt, had adopted many of their customs, as well as intermingled some portion of their language with their own; but in all other parts of Germany, we find such an exact conformity in their religion, laws, customs and language, as affords a very strong presumption that they were descended from the same ancient stock with the Celts or Gauls, and that they came by gradual and successive migrations from Asia. (See *CELTS*.) How this country came to be denominated Germany, and whence its inhabitants derived the appellation of Germans, it is not easy to determine. The most probable conjecture is, that they were so called, either from their affinity to the Celtes, or from the Celtic words "ghar man," a warlike man; but this was not their original name, any more than the appellations of "Teutones" or "Allemanni," by which, as we have already observed, they were occasionally denominated. This name was of a more modern date, and seems to have had its rise on the other side of the Rhine, when the Condruvi, Eburones, Cerafi, and Pœmani crossed that river, after the example of some others of their countrymen, and settled in Gaul. These, it seems, were the first to whom the appellation of Germans was given, and which, therefore, extended no farther than the Rhenish shore on the Gallic side, but soon after passed over to the other, and became common to other people of the same language and customs, till at length it became the general name of the whole nation, and the country was called from thence Germania or Germany.

Whatever may be supposed to be the remote origin of the Germans, they appear to have been in a savage and uncivilized state on their first settlement in this country. The account given of the country itself by Cæsar and Tacitus is so unfavourable, that it seems to be almost incredible, that a brave nation, for such we must allow the ancient Germans to have been, would have been contented to remain in it, when they were destitute of neither strength nor courage to have forced their way into others more pleasant and fruitful. These ancient historians describe it as wholly barren and uncultivated; and even its variety of soil and climate added to the horror of it, from the dreadful forests, putrid and insalubrious bogs, the inclemency of its winds, dampness of its fæces, lakes, and rivers, and sterility of its soil. The uncivilized state of the ancient Germans may be inferred from the account given of them by Tacitus; for in his time they were unacquainted with the use of letters (*German. ii. 19*); and the use of letters is the principal circumstance that distin-

guishes a civilized people from a herd of savages incapable of knowledge or reflection.

Of the useful and agreeable arts of life the ancient Germans were wretchedly destitute. Modern Germany is said to contain about 2,300 walled towns, whereas, in a much wider extent of country, the geographer Ptolemy could discover no more than ninety places, which he decorates with the name of cities, though, according to our ideas, they would not deserve that splendid title. We can only suppose them to have been rude fortifications, constructed in the centre of the woods, and designed to secure the women, children, and cattle, whilst the warriors of the tribe marched out to repel a sudden invasion. Such is the account given of them by Cæsar; and Tacitus asserts that the ancient Germans had no cities. Even in their hamlets or villages they did not build their houses contiguous to each other. They considered it as a badge of servitude to be obliged to dwell in a city surrounded with walls. Each barbarian fixed his independent dwelling on the spot to which a plain, a wood, or a stream of fresh water had induced him to give the preference. Neither stone, nor brick, nor tiles, were employed in these slight habitations. They were, indeed, no more than low huts of a circular figure, built of rough timber, thatched with straw, and pierced at the top to leave a free passage for the smoke. That they considered cities as places of confinement rather than of security, appears from the following circumstance: when one of their tribes had shaken off the Roman yoke, their countrymen required of them, as an evidence of their having recovered liberty, to demolish the walls of the towns which the Romans had built in their country. The Romans built several cities of note on the banks of the Rhine. But in all the vast countries from that river to the coasts of the Baltic, there was hardly one city previous to the ninth century of the Christian era.

In the most inclement winter, the hardy German was satisfied with a scanty garment made of the skin of some animal. The natives, who dwelt towards the north, clothed themselves with furs; and the women manufactured for their own use a coarse kind of linen. The game of various sorts, with which the forests of Germany were plentifully stocked, supplied its inhabitants with food and exercise. Their monstrous herds of cattle, less remarkable for their beauty than for their utility, formed the principal article of their wealth. A small quantity of corn was the only produce exacted from the earth. The use of orchards, or artificial meadows, was unknown to the Germans; nor can we expect any improvements in agriculture from a people, whose property every year experienced a general change by a new division of the arable lands, and who, in that strange operation, avoided disputes, by suffering a great part of their territory to lie waste and without tillage. Gold, silver, and iron, were extremely scarce in Germany. Its barbarous inhabitants wanted both skill and patience to investigate those rich veins of silver, which have so liberally rewarded the attention of the princes of Brunswick and Saxony. Although the various transactions of peace and war had introduced some Roman coins (chiefly silver) among the borderers of the Rhine and Danube; yet the more distant tribes were absolutely unacquainted with the use of money, carried on their limited traffic by the exchange of commodities, and prized their rude earthen vessels as of equal value with the silver vases, the presents of Rome to their princes and ambassadors. If we contemplate a savage nation in any part of the globe, a supine indolence and a carelessness of futurity will be found to constitute their general character. This was decidedly the case with respect to the ancient Germans. The care of the house and family, the management

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of the land and cattle, were delegated to the old and infirm, to women and slaves. The lazy warrior, destitute of every art that might employ his leisure hours, consumed his days and nights in the animal gratifications of sleep and food. Nevertheless, the sound that summoned the German to arms was grateful to his ear. It raised him from his uncomfortable lethargy, gave him an active pursuit, and, by strong exercise of the body, and violent emotions of the mind, restored him to a more lively sense of his existence. In the dull intervals of peace, these barbarians were immoderately addicted to deep gaming and excessive drinking; both of which, by different means, the one by inflaming their passions, the other by extinguishing their reason, alike relieved them from the pain of thinking. They gloried in passing whole days and nights at table; and the blood of friends and relations often stained their numerous and drunken assemblies. The possession and the enjoyment of property are the pledges which bind a civilized people to an improved country. But the Germans, who carried with them what they most valued, their arms, their cattle, and their women, cheerfully abandoned the vast silence of their woods for the unbounded hopes of plunder and conquest. The innumerable swarms that issued, or seemed to issue, from the great store-house of nations, were multiplied by the fears of the vanquished, and by the credulity of succeeding ages. And from facts thus exaggerated, an opinion was gradually established, and has been supported by writers of distinguished reputation, that in the age of Cæsar and Tacitus the inhabitants of the north were far more numerous than they are in our days. On this subject Sir William Temple and Montesquieu have indulged the usual liveliness of their fancy. A more serious inquiry into the causes of population, seems to have convinced modern philosophers of the falshood, and indeed the impossibility, of the supposition. To the names of Mariana and of Machiavel, we can oppose the equal names of Robertson and Hume.

A warlike nation like the Germans, without cities, letters, arts, or money, found some compensation for this savage state in the enjoyment of liberty. Their poverty secured their freedom, since, says Gibbon, our desires and our possessions are the strongest letters of despotism. Cæsar and Tacitus inform us, that the state of society among the ancient Germans was of the rudest and most simple form. They lived entirely by hunting or pasturage. They neglected agriculture, as we have already seen; their chief food was milk, cheese, and flesh. While society remains in this simple state, men, by uniting together, scarcely relinquish any portion of their natural independence. The authority of civil government was extremely limited among the Germans. In times of peace they had no common or fixed magistrate; but the chief men of every district dispensed justice and accommodated differences. In the far greater part of Germany, the form of government was a democracy, tempered indeed, and controlled, not so much by general and positive laws, as by the occasional ascendant of birth and valour, of eloquence and superstition. Some tribes, however, on the coast of the Baltic, acknowledged the rights of kings; but their kings had not absolute or unbounded power; their authority consisted rather in the privilege of advising than in the power of commanding. Matters of small consequence were determined by the chief men; affairs of importance, by the whole community. As soon as a youth, born of free parents, had attained the age of manhood, he was introduced into the general council of his countrymen, solemnly invested with a shield and a spear, and adopted as an equal and worthy member of the military commonwealth. The assembly of the tribe was

convened at stated seasons, or on sudden emergencies. The trial of public offences, the election of magistrates, and the great business of peace and war, were determined by its independent voices. Sometimes these important questions were previously considered, and prepared in a more select council of the principal chieftains. The magistrates might deliberate and persuade; the people only could resolve and execute. When timid, though just and prudent, counsels were proposed, they expressed their dislike by a hollow murmur. But whenever a popular orator proposed to vindicate the meanest citizen from either foreign or domestic injury, whenever he called upon his fellow-countrymen to assert the national honour, or to pursue some enterprize full of danger and glory, a loud clashing of shields and spears expressed the eager applause of the assembly; for the Germans always met in arms. On occasions of danger a general of the tribe was elected; and in circumstances of pressing and extensive danger, several tribes concurred in the choice of the same general. The bravest warrior was named to lead his countrymen into the field, by his example rather than his commands. His power expired with the war, and in time of peace the German tribes acknowledged not any supreme chief. Princes were, however, appointed, in the general assembly, to administer justice, or rather to compose differences (minuunt controversias, Cæsar) in their respective districts. To the choice of these magistrates, birth was regarded as much as merit. To each was assigned, by the public, a guard, and a council of 100 persons; and the first of the princes appears to have enjoyed a pre-eminence of rank and honour, which sometimes tempted the Romans to compliment him with the regal title. The Germans respected only those duties which they imposed on themselves. The most obscure soldier resisted with disdain the authority of the magistrates. Every individual among the ancient Germans was left at liberty to chuse whether he would take part in any military enterprize which was proposed; it became, of consequence, the great object of every person, who aimed at being a leader, to gain adherents and to attach them to his person and interest. Cæsar calls these adherents *Ambacti* and *Clientes*, *i. e.* retainers or clients. Tacitus calls them *Comites*, or companions. The chief distinction and power of the leaders consisted in being attended by a numerous band of chosen youth. This was their pride as well as ornament during peace, and their defence in war. The leaders gained, or preserved, the favour of these retainers by presents of armour and of horses, or by the profuse though inelegant hospitality with which they entertained them. But even after they united in society, the Germans circumscribed the criminal jurisdiction of the magistrate within very narrow limits, and exercised almost all the rights of private resentment and revenge. Their magistrates had the absolute disposal of the landed property within their district, and they distributed it every year according to a new division; but they had not the power of imprisoning, or of inflicting any corporal punishment on a private citizen. Every individual was obliged to avenge the wrongs which his parents or friends had sustained. Their enemies were hereditary, but not irreconcilable. Even murder was compensated by paying a certain number of cattle. A part of the fine went to the king or state, a part to the person who had been injured, or to his kindred.

Chastity is ascribed, almost without exception, to the wives of the ancient Germans. Polygamy was not in use, except among the princes, and among them only for the sake of multiplying their alliances. Divorces were prohibited by manners rather than by laws. Adulteries were punished as rare and inexpiable crimes; nor was seduction justified by

example

example and fashion. Tacitus evidently indulges an honest pleasure in the contrast of barbarian virtue with the dissolute conduct of the Roman ladies; yet there are some striking circumstances that give an air of truth, at least of probability, to the conjugal faith and chastity of the Germans. The German huts, open on every side to the eye of indifference or jealousy, were a better safeguard of conjugal fidelity than the walls, the bolts, and the eunuchs of a Persian harem. Besides, the Germans treated their women with esteem and confidence, consulted them on every occasion of importance, and fondly believed that in their breasts resided a sanctity and wisdom more than human. Some of these interpreters of fate, such as Valleda, in the Batavian war, governed, in the name of the Deity, the fiercest nations of Germany. The rest of the sex, without being adored as goddesses, were respected as the free and equal companions of soldiers; associated, even by the marriage ceremony, to a life of toil, of danger, and of glory. In their great invasions, the camps of the barbarians were filled with a multitude of women, who remained firm and undaunted amidst the sound of arms, the various forms of destruction, and the honourable wounds of their sons and husbands. The women dreaded death much less than servitude. If the day was irrecoverably lost they well knew how to deliver themselves and their children, with their own hands, from an insulting victor. Heroines of such a cast may claim our admiration; but they were most assuredly neither lovely, nor very susceptible of love.

Conscious pride taught the German females to suppress every tender emotion that stood in competition with honour, and the first honour of the sex has ever been that of chastity.

The religious system of the Germans was dictated by their wants, their fears, and their ignorance. They adored the great visible objects and agents of nature, the sun and the moon, the fire and the earth; together with those imaginary deities who were supposed to preside over the most important occupations of human life. They were persuaded that by some ridiculous arts of divination, they could discover the will of the superior beings, and that human sacrifices were the most precious and acceptable offering on their altars. If there was any difference between the Gauls and Germans in point of religion, it consisted only in this, that the latter, being more fierce and untractable, were not only more tenacious of their superstitious rites, but likewise more cruel and inhuman in them. It appears, from the testimonies of Cæsar, Tacitus, Diodorus Siculus, Strabo, Athenæus, and other ancient authors, that the Germans had no temples, but performed their religious rites in groves erected for that purpose, or in woods, forests, and desert places. Temples were not introduced in Germany till long after the Gauls had erected them: and the inferior divinities introduced among the Gauls, such as Jove or Jupiter, Mars, Apollo, Mercury, Venus, Diana, &c. were also adopted by the Germans, though some of them were represented under different names and attributes. Jupiter was worshipped under the name of Thor or Taran, *i. e.* the Thunderer; this name was given by the Gauls to Mars; and the Germans bellowed it on their Odin or Woden; but the name of Jupiter was never adopted by the Gauls, nor by the Germans. Both Gauls and Germans agreed in worshipping the supreme deity under the name of Hesus or Esus, and under the emblem of an oak, which was consecrated to him. The goddess Hertha was one of their ancient deities, and her idol was preserved in a wood or grove, "Castum nemus," upon a covered cart, and she had but one priest to minister to her, who was the only person that was allowed to approach

her. The worship of this goddess corresponded with that which the Romans and others paid to the "Earth," under the name of "Magna Deorum Mater." A solemn procession was occasionally celebrated in the present countries of Mecklenburg and Pomerania. The unknown symbol of the "Earth," covered with a thick veil, was placed on a carriage drawn by cows; and in this manner the goddess, whose common residence was in the isle of Rugen, visited several adjacent tribes of her worshippers. During her progress, the sound of war was hushed, quarrels were suspended, arms laid aside, and the restless Germans had an opportunity of talling the blessings of peace and harmony. The "Truce of God," so often and so ineffectually proclaimed by the clergy of the 11th century, was an obvious imitation of this ancient custom.

The influence of religion on the minds of the ancient Germans was far more powerful to inflame than to moderate their fierce passions. The consecrated standards, long revered in the groves of superstition, were placed in the front of the battle; and the hostile army was devoted with dire execrations to the gods of war and of thunder. A brave man was the worthy favourite of their martial deities; and the wretch who had lost his shield was banished alike from the religious and the civil assemblies of his countrymen. Some tribes of the north seem to have embraced the doctrine of transmigration; others imagined a gross paradise of immortal drunkenness. (See the Edda, fable 20.) All agreed, that a life spent in arms, and a glorious death in battle, were the best preparations for a happy futurity, either in this or in another world.

It is said that the Germans, as well as Gauls, were early taught by their Druids, as fundamental truths, an overruling providence, and the immortality of the soul; but these noble principles of religion and virtue were soon corrupted as instruments of divination and superstition. Cæsar says, indeed, (Com. l. vi. c. 21.) that the Germans had no druids, as the Celtes had; but Tacitus, who was better acquainted with the Germans, speaks frequently of their priests, whose office and authority, as he states them, were similar to those of the Gaulish druids, and they seem to have been of the same order of men, though perhaps they did not bear the same name. As to the immortality promised by their priests, it was in some degree conferred by the bards, who by their military songs kindled in the breasts of their audience the enthusiasm of arms and glory. The view of arms and of danger heightened the effect of these songs; and the passions which they tended to excite, the desire of fame, and the contempt of death, were the habitual sentiments of a German mind. A contempt of danger and of death was one of the principles which they instilled into the minds of their youth, and a regard to which their priests inculcated as the surest means of reputation and wealth, and also of happiness in a future life. Under the influence of this principle their armies, which consisted more of infantry than cavalry, were easily raised and maintained. Like the Gauls and Britons, the Germans fought in separate cantons or tribes; and thus they were induced to exert themselves with the greater firmness and vigour in defence of their relations, neighbours, and friends, and for the honour of their respective communities. We are told, indeed, that some of them, especially the Cimbri, formed their whole infantry into one square battalion, and placed their wives, children, and baggage behind a fence made of their waggon; and when they were prepared for an attack, a signal was given, which was echoed by an universal shout, and repeated till the engagement commenced. They used no art or stratagem in fighting, but wholly confided in a furious

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onset on the enemy, which they maintained with a desperate intrepidity till the day was won or lost: if they were once thrown into disorder they seldom rallied, but became desperate, and either fought till they were slaughtered, or betook themselves to flight; for it was reckoned inglorious to yield themselves prisoners. The military weapons of the cavalry among the Germans were shields and spears, which they used in common with the foot, but the latter had, besides their darts, bows and slings, and seldom had recourse to their pikes and swords. Their arms were esteemed their favourite furniture and chief ornament; so that they never appeared in public without them. The sword was so sacred, that the most solemn and obligatory oaths were those which they took upon a naked blade. Nor did they assist in any solemn rite, without their sword, shield, or spear. They even wore them at their familiar visits, banquets, and religious dances; and they were frequently to be burnt or buried with them, when they died. The sports, games, and exercises of the Germans, were of the masculine kind, and such as inured them to the operations of war. It was a long time before they acquired any knowledge of the liberal arts, or even that of writing; and we are told, that Charles the Great caused some of their barbarous poems, which they had been accustomed to sing from memory, and which celebrated the illustrious actions of their ancient kings and heroes, to be committed to writing for their use, and by way of encouraging them to learn to read. The Saxons, it is said, had such a contempt for letters, that they refused to learn to read the gospels till they were put into verse, and set to such tunes as they could easily sing. Even their laws were not reduced to writing till about the 12th or 13th centuries.

The native disposition of the ancient Germans displayed itself chiefly in their martial genius, and in their singular fidelity. In some cases their love of liberty, and hatred of tyranny and oppression, precipitated them to acts of treachery and even of murder; for in such cases they were easily incensed, and extremely vindictive. On other occasions, Tacitus says, they were noble, magnanimous, and beneficent, without ambition to aggrandize their dominions, or to invade those from whom they received no injury; rather chusing to employ their strength or valour defensively, than offensively; to preserve their own, than to revenge their neighbours. In their own houses, furniture and diet, they were distinguished by their plainness and simplicity; but at the same time, they were no less distinguished by their hospitality to strangers, and by their readiness to succour those that were in distress. Although in most of their customs the Germans very much resembled the Gauls, yet, with regard to their funerals, they were very different. The latter performed these obsequies with pomp and profusion; whereas the Germans discharged their last offices to the dead with plainness and simplicity; the only grandeur they affected, was to burn the bodies of their great men with some peculiar kinds of wood; and afterwards they flung each man's armour into the funeral pile, and sometimes his riding dress. They then deposited their ashes in urns, like the Gauls, Romans, and other nations. It may be observed in general, that the sacrifices they offered for their dead, the presents made to them at their funerals, and the other superstitious rites performed on these occasions, were all the result and the evidence of an established belief, that the soul was immortal.

The ancient Germans were a brave and independent race of men, and peculiarly distinguished by their love of liberty and arms. They opposed the Roman power, after it had arrived at maturity. After their contest with Cæsar, who was provoked by the Treviri to invade their country, and

their revolt against Augustus, which was suppressed by Agrippa, and the insurrection which commenced among the Roman legions in Pannonia, quelled partly by Drusus, and finally by Germanicus; their other more considerable wars with the Romans were waged against the emperors M. Aurelius, Alexander, Maximian, Valerian, Aurelian, Probus, Constantius, Julian, Valentinian, and some of his successors. Some notice is taken of these conflicts under the names of the Alemanni, Gepidæ, Franks, Suevi, Heruli, and Burgundians. Their country was divided into a number of petty sovereignties, independent of each other, though occasionally connected by a military union, until it was reduced to the condition of a Roman province; and when the Roman empire was shattered by the Northern barbarians, Germany was over-run by the Franks about the year 480, and continued in subjection to chieftains of that nation, who governed over the Suabians, Alemans, Frisians, Saxons, Thuringians, and Bavarians, until the end of the eighth century, when Charlemagne united all Germany into one kingdom, as part of the Frankish monarchy. The conquered German nations had hereditary dukes of their own at first, and were governed by their own laws: but Charlemagne put an end to the former, and governed the different German provinces by counts and royal delegates, and in the year 800 he assumed the title and dignity of emperor. But the empire of Charlemagne was a structure erected in so short a time, that it could not be of long duration. Under his immediate successor it began to totter, and soon after fell to pieces. The crown of Germany was separated from that of France, and the descendants of Charlemagne established two great monarchies, so situated, as to give rise to a perpetual rivalry between them. But the princes of the race of Charlemagne, who were placed on the Imperial throne, were not altogether so degenerate as those of the same family who reigned in France. In the hands of the former, the royal authority retained some vigour; the nobles of Germany, though possessed of extensive privileges and ample territories, did not so early attain independence. The great offices of the crown continued at the disposal of the sovereign, and during a long period, fiefs remained in their original state without becoming hereditary in the families of the persons to whom they had been granted.

At length, the German branch of the family of Charlemagne became extinct upon the death of Louis IV. His feeble descendants who reigned in France had sunk into such contempt, that the Germans, without looking towards them, exercised the right inherent in a free people; and in a general assembly of the nation at Worms, in the year 911, offered the imperial crown to Otho, duke of Saxony, who declined it on account of his great age, and recommended Conrad, count of Franconia. The latter was unanimously elected emperor. His reign was disturbed by the disobedience of some nobles whom he subdued, and by the pretensions of Henry, son of the duke of Saxony, his benefactor. Their quarrels, however, did not prevent Conrad from acknowledging the merit of that prince in the same manner as Otho had done his. He recommended Henry as the fittest prince to be his successor, and his proposal being approved by the nation, he sent to Henry, without waiting for the hour of death, the crown, the sceptre, the lance, the sword, and other imperial ornaments.

Henry I. ascended the imperial throne of Germany in 919. He was surnamed the *Fowler*, because he was passionately fond of hawking. To confirm his authority, he made more use of persuasion than of arms. His descendants, the three Othos, were placed in succession on the imperial throne by the suffrages of their countrymen. The extensive terri-

ories of the Saxon emperors, their eminent abilities, and enterprising genius, not only added new vigour to the imperial dignity, but raised it to higher power and pre-eminence. Otto the Great marched at the head of a numerous army into Italy, and, after the example of Chaulmagne, gave law to that country. On his arrival at Rome, he was consecrated by the pope, and crowned emperor of the Romans. He created popes and deposed them by his sovereign mandate. He annexed the kingdom of Italy to the German empire. Related with his success, he assumed the title of Cæsar Augustus. A prince, born in the heart of Germany, pretended to be the successor of the emperors of ancient Rome, and claimed a right to the same power and prerogative. See the biographical article OTTO.

But while the emperor, by means of these new titles and new dominions, gradually acquired additional authority and splendour, the nobility of Germany had gone on at the same time extending their privileges and jurisdiction. The situation of affairs was favorable to their attempts. The vigour which Chaulmagne had given to government quickly relaxed. The incapacity of some of his successors was such, as would have encouraged vassals, less enterprising than the nobles of that age, to have claimed new rights, and to have assumed new powers. The civil wars in which other emperors were engaged, obliged them to pay perpetual court to their subjects, on whose support they depended, and not only to connive at their usurpations, but to permit and even to authorize them. Fiefs gradually became hereditary. They were transmitted not only in the direct, but also in the collateral line. The investiture of them was demanded not only by male but by female heirs. Every baron began to exercise foreign jurisdiction within his own domains, and the dukes and counts of Germany took wide steps towards rendering their territories distinct and independent states. The Saxon emperors observed their progress, and were aware of its tendency. But as they could not hope to humble vassals already grown too potent, unless they had turned their whole force and attention to that enterprise, and as they were extremely intent on their expeditions into Italy, which they could not undertake without the concurrence of their nobles, they were solicitous not to alarm them by any direct attack on their privileges. They aimed, however, at undermining their power. With this view, they inconsiderately bestowed additional territories, and accumulated new honours on the clergy, in hopes that this order might serve as a counterpoise to that of the nobility in any future struggle.

The unhappy effects of this fatal error in policy were quickly felt. Under the emperors of the Franconian and Swabian lines, whom the Germans, by their voluntary election, placed on the imperial throne, a new face of things appeared, and a scene was exhibited in Germany which astonished all Christendom at that time. The popes, hitherto dependent on the emperors, and indebted for power as well as dignity to their beneficence and protection, began to claim a superior jurisdiction, and in virtue of authority, which they pretended to derive from heaven, tried, condemned, excommunicated, and deposed their former masters. These pretensions gave rise to the factions of the Guelphs and Ghibelines, of which the former was attached to the popes, and the latter to the emperors. Pope Gregory VII. had observed that the princes and nobles of Germany had acquired such considerable territories and such extensive jurisdiction, as rendered them not only formidable to the emperors, but disposed them to favour any attempt to circumscribe their power. He foresaw that the ecclesiastics of Germany, raised almost to a level with its princes, were ready to support any person who would stand forth as the protector of their pri-

villeges and independence. With both of these Gregory negotiated, and had secured many devoted adherents among them, before he ventured to enter the lists against the head of the empire. He began his rupture with Henry IV. upon a pretext that was popular and plausible. He complained of the venality and corruption with which the emperor had granted the investiture of benefices to ecclesiastics. He contended that this right belonged to him, as the head of the church; he required Henry to confine himself within the bounds of the civil jurisdiction, and to abstain for the future from such sacrilegious encroachments on the spiritual dominion. All the censures of the church were denounced against Henry, because he refused to relinquish these powers which his predecessors had uniformly exercised. The most considerable of the German princes and ecclesiastics were excited to take arms against him. His mother, his wife, his sons, were wrought upon to disregard all the ties of blood and duty, and to join the party of his enemies. At length, the emperor was even obliged to appear as a supplicant at the gate of the castle in which the pope resided, and to stand there three days barefooted in the depth of winter, imploring a pardon, which he obtained with difficulty.

This act of humiliation degraded the imperial dignity. The two factions kept Germany and Italy in perpetual agitation during three centuries, and, notwithstanding the return of some short intervals of vigour, under the administration of a few able emperors, the imperial authority continued to decline. During the anarchy of a long interregnum, subsequent to the death of William of Holland, it dwindled down almost to nothing.

In the year 1273, Rodolphus of Hapsburgh, the founder of the house of Austria, was elected emperor, not that he might re-establish and extend the imperial authority, but because his territories and influence were so inconsiderable as to excite no jealousy in the German princes, who were willing to preserve the forms of a constitution, the power of which they had destroyed. Several of Rodolph's successors were placed on the imperial throne from the same motive, and almost every remaining prerogative was wrested out of the hands of feeble princes, unable to exercise or to defend them.

During this period of turbulence and confusion, the constitution of the German empire underwent a total change. The princes, the great nobility, the dignified ecclesiastics, and the free cities extended their usurpations. They claimed and exercised the right of governing their respective territories with full sovereignty. They acknowledged no superior with respect to any point relative to the interior administration and police of their domains. They enacted laws, imposed taxes, coined money, declared war, concluded peace, and exercised every prerogative peculiar to independent states. The forms of feudal subordination formed the only connection among the various members of the community. This bond of union, however, was extremely feeble.

From the accession of Rodolph of Hapsburgh, to the reign of Maximilian, the empire felt every calamity which a state must endure, when the authority of government is so much relaxed. The dissensions among its members gave rise to perpetual private wars, which were carried on with all the violence that accompanies resentment when unrestrained by superior authority. Rapine, outrage, exactions, became universal. The variety of expedients employed to restore order and tranquillity, prove that the grievances occasioned by this state of anarchy had become intolerable. Arbiters were appointed to terminate the differences among the several states. The cities united in a league to check the extortions of the nobility, and the latter formed confederacies to main-



tain tranquillity among their own order. Germany was divided into ten circles, in each of which a provincial jurisdiction was established. But all these remedies proved ineffectual. At length Maximilian instituted the imperial chamber, a tribunal composed of judges named partly by the emperor, partly by the several states, and vested with authority to decide finally concerning all differences among the members of the Germanic body, and thus restored some degree of vigour to the imperial authority.

But notwithstanding the salutary effects of these regulations, the political constitution of the German empire, at the beginning of the sixteenth century, was of a species so peculiar as not to resemble perfectly any form of government known either in the ancient or modern world. It was a complex body, formed by the association of several states, electors, princes, dignitaries of the church, counts, barons, and free cities, each of which possessed sovereign and independent jurisdiction within its own territories. Of all the members which composed this united body, the emperor was the head. In his name all decrees and regulations, with respect to points of common concern, were issued; and to him the power of carrying them into execution was committed. But this appearance of monarchical power in the emperor was more than counterbalanced by the influence of the princes and states of the empire in every act of administration. No law extending to the whole body could pass, no resolution that affected the general interest could be taken without the approbation of the diet of the empire held at Ratisbon. In this assembly every sovereign prince and state of the Germanic body had a right to be present, to deliberate and to vote. The decrees or recesses of the diet were the laws of the empire, which the emperor was bound to ratify, and to enforce. In this respect the German empire was similar to the Achaean league in ancient Greece, or to that of the United Provinces of the Netherlands, and of the Swiss cantons in modern times. But, as the acute historian of the emperor Charles V. observes, the Germanic body was not formed by the union of members altogether distinct and independent. All the princes and states, joined in this association, were originally subject to the emperors, and acknowledged them as sovereigns. They originally held their lands as imperial fiefs, and owed the emperor all those services which feudal vassals are bound to perform to their liege lord. But though this political subjection was entirely at an end, the ancient forms introduced while the emperors governed Germany with authority not inferior to that which the other monarchs of Europe possessed, still remained. Thus an opposition was established between the genius of the government and the forms of administration in the German empire. The former considered the emperor only as the head of a confederacy, the members of which, by their voluntary choice, raised him to that dignity; the latter seemed to imply that he is really invested with sovereign power. The emperors were distinguished by the most pompous titles, and by such marks of dignity as intimated their authority to be superior to that of all other monarchs. The greatest princes of the empire attended and served them, on some occasions, as officers of their household. They exercised prerogatives which no other sovereigns ever claimed. They retained pretensions to all the extensive powers which their predecessors had enjoyed in any former age. But, at the same time, instead of possessing that ample domain which had belonged to the ancient emperors of Germany, and which stretched from Basil to Cologne, along both banks of the Rhine, they were stripped of all territorial property, and had not a foot of land that belonged to them as heads of the empire. Their revenues were reduced almost to nothing, and the extraordi-

nary aids which, on a few occasions, they obtained, were granted sparingly, and paid with reluctance. The consequence of this ill-compact frame of government was, that the emperors imagined themselves to be the real sovereigns of Germany, and aimed continually at recovering the exercise of those powers which the forms of the constitution seemed to vest in them, and which their predecessors Charlemagne and the Otobes had actually enjoyed. The princes and states, aware of these pretensions, watched the motions of the imperial court to circumscribe its power within limits still more narrow. This jealousy of the imperial authority increased considerably from the time that the elective power was vested in a few princes of chief dignity.

During a long period, all the members of the Germanic body had a right to assemble, and to make a choice of the person whom they appeared to be their head. But amidst the violence and anarchy which prevailed for several centuries in the empire, seven princes, who possessed the most extensive territories, and who had obtained an hereditary title, the great offices of the state, acquired the exclusive privilege of nominating the emperor. This right was confirmed to them by the golden bull (See Bull); the mode of exercising it was ascertained, and they were dignified with the appellation of *Electors*. (See Elector.) The nobility and free cities, being thus stripped of a privilege which they had once enjoyed, were left connected with a prince, towards whose elevation they had not contributed by their suffrages, and came to be more apprehensive of his authority. The electors, by their extensive power, and the distinguishing privileges which they possessed, became formidable to the emperors, with whom they were placed almost on a level in several acts of jurisdiction. Thus, the introduction of the electoral college into the empire strengthened the principles of discord in the Germanic constitution, which were continually alimented by the various and repugnant forms of civil policy in the several states. The free cities were small republics, in which the maxims and spirit peculiar to that species of government prevailed. The princes and nobles to whom supreme jurisdiction belonged possessed a sort of monarchical power within their own territories. Their common deliberations could not be carried on with the same spirit while the love of liberty and attention to commerce were the reigning principles in the cities; and the desire of power, and ardour for military glory, the governing passions of the princes and nobility. The secular and ecclesiastical members of the empire were as little fitted for union as the free cities and the nobility. Considerable territories had been granted to several of the German bishops and abbots, and some of the highest offices of the empire, having been annexed to them unalienably, were held by the ecclesiastics raised to these dignities. The younger sons of nobles of the second order, who had devoted themselves to the church, were commonly promoted to these stations of eminence and power; and it was no small mortification to the princes and great nobility, to see persons raised from an inferior rank to the same level with themselves, or even exalted to superior dignity. The education of these churchmen, the genius of their profession, and their connection with the court of Rome, rendered their character, as well as their interest, different from that of the other members of the Germanic body, with whom they were called to act in concert. Thus another source of variance was opened.

To all these causes of dissension must be added another, arising from the unequal distribution of power and wealth among the states of the empire. The electors and other nobles of the highest rank not only possessed sovereign jurisdiction, but governed such extensive, populous, and im-

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countries, as rendered them great princes. Many of the other members, though they enjoyed all the rights of sovereignty, ruled over such petty domains, that their real power bore no proportion to this high prerogative. The electors and emperors, by turns, endeavoured to extend their own authority, by encroaching on those feeble members of the Germanic body, who sometimes defended their rights with much spirit, but more frequently, being overawed or corrupted, tamely surrendered their privileges, or meanly favoured the designs formed against them.

But the empire of Germany comprehended countries of such vast extent, and was inhabited by such a martial and hardy race of men, that when the abilities of an emperor, or zeal for any common cause could rouse this unwieldy body, it was still able to act with force. Charles V. grandson of Maximilian, and heir to the kingdom of Spain, in right of his mother, was elected emperor in the year 1519. In his reign happened the reformation of religion caused by Luther, which occasioned incessant wars till 1648. (See LUTHER and REFORMATION.) There were moments when Charles V. flattered himself with the hope of being able to hold the balance between the Roman Catholics and the Lutherans. But the contending parties were too much inflamed with animosity, and in addition to his wars against Francis I. of France, he was forced to sustain a violent one in the heart of the empire. Fortune, which smiled upon him in the beginning of his reign, forsook him towards its end. He abdicated the imperial throne, in 1558, in favour of his brother Ferdinand I., who had the address of getting his son Maximilian II. declared king of the Romans, or successor to the imperial crown in his life-time. This precaution became familiar to the house of Austria, and kept the imperial sceptre in that family, until the extinction of the German empire. By his last will Ferdinand ordered that if either his own male issue, or that of his brother Charles should fail, his Austrian estates should revert to his second daughter Anne, wife to the elector of Bavaria. This circumstance is the origin of the opposition made by the house of Bavaria, in later times, to the Pragmatic sanction in favour of Maria Theresa, mother of Joseph the second.

The reign of Maximilian II. was disturbed by internal commotions, and an invasion from the Turks. He died in 1576, and was succeeded by his son Rodolph, who was involved in wars with the Hungarians, and in differences with his brother Matthias, to whom the empire devolved at his death. Having no children, Matthias conferred the crown of Hungary on his cousin Ferdinand arch-duke of Austria, and caused him to be elected king of Bohemia, which election proved the source of a long war. Ferdinand persecuted the numerous sectaries in Bohemia. They took up arms; the brave Mansfeld fought at their head, and Matthias, who came to the assistance of his kinsman, died of vexation, for not having been able to obtain a complete triumph over the Bohemians. A tender of the imperial crown was made to Maximilian, duke of Bavaria, who prudently declined the offer. Ferdinand was therefore proclaimed emperor in 1619, but the Bohemians, maintaining that the same individual could not wear the crown of Germany together with that of Bohemia, conferred the latter on Frederick, the elector palatine. Yielding to the intreaties of his spouse Elizabeth, daughter of James I. of England, against his own conviction, Frederick made a splendid triumphal entry into Prague; but a few days after, his army was attacked on the heights near the town, and completely routed. He was obliged to fly with his wife and children, and found at last an asylum in Holland. His defeat was the beginning of the thirty years' war which ravaged Germany from the Danube and the

Rhine to the shores of the Baltic, without little intermission from the battle of Prague to the peace of Westphalia. The unfortunate Frederick, who had been put under the ban of the empire, died broken-hearted. Ferdinand's arms were almost constantly victorious against the Protestant princes for the space of ten years. He was on the point of crushing their party when Gustavus Adolphus of Sweden rushed upon him. In vain did the Imperialists commanded by Tilly endeavour to check his career; they were defeated and dispersed. Ferdinand was going to sue for peace when the fall of the Swedish monarch at Lutzen re-animated his hopes: Wallenstein's defection did not arrest his arm. He continued fighting against his Protestant vassals to the hour of his death, which happened in 1637. The war raged with unabated fury under his son Ferdinand III. who was appointed his successor on the imperial throne. The Protestant cause was ably defended by the heroes brought up under the great Gustavus Adolphus. History will never forget the names of the duke of Saxe Weimar, of Banner, Torstenson, Piccolomini, Merci, Wrangel, and many others who shook the Austrian power, till at length a general peace was concluded in 1648, which being guaranteed by Sweden and France, has been considered for a century and a half as forming the basis of the political system of Europe, under the name of the peace of Munster or peace of Westphalia.

Leopold I. who was elected emperor of Germany, after the death of his father Ferdinand III. in the year 1657, had to combat the French on one side, and the Turks on the other. The latter advanced to the walls of Vienna, but were compelled to raise the siege by the valour of John Sobieski, king of Poland. The fertile province of Alsace was conquered by France, but the Turks, having been repeatedly defeated by prince Eugene of Savoy, were forced to cede Transylvania by the peace of Carlowitz in 1699. During Leopold's long reign, the duke of Hanover was admitted into the electoral college, the elector of Saxony obtained the elective royal crown of Poland, the elector of Brandenburg was acknowledged hereditary king of Prussia, and a prince of the Bourbon family was seated on the Spanish throne. Leopold died in 1705. The reign of his son Joseph I. lasted but six years, and is remarkable only for the victories which the great duke of Marlborough gained in his cause over the French. As he left no male issue, the elector of Mayence exerted all his influence to procure the imperial crown to his brother the archduke Charles, who was at that time in Spain, disputing the crown of that kingdom with Philip of Anjou, grandson to Louis XIV. The elevation of Charles to the empire terminated the contentions which had harassed Spain and Germany. The peace of Utrecht, concluded in 1713, was followed by that of Baden with France in 1714, and that of Passarowitz with the Turks in 1717.

Charles VI. intent upon securing his hereditary dominions to the archduchess Maria Theresa his daughter, framed that famous Pragmatic sanction which was soon to disturb again the peace of Germany. Happily for him the crown of Great Britain devolved to the house of Hanover, which circumstance drew the connection of Austria and England against their common enemy more close. Charles VI. married his daughter to Francis duke of Lorraine, and died in 1740. No sooner was he in the grave than the Pragmatic sanction was attacked on all sides. The great Frederick of Prussia conquered Silesia, and Spain and Bavaria preferred their claims on several provinces. The intrigues of France caused the imperial throne to be filled, after an interregnum of two years, by the elector of Bavaria, who took the name of Charles VII., and was proclaimed emperor in 1742.

But after five years of disastrous warfare, he died deprived nearly of all his states. Maria Theresa had sufficient influence to place her husband on the throne of the empire in 1745. Francis I. was acknowledged as emperor of Germany by the king of Prussia at the peace of Dresden, signed on the 25th of December 1745, and by the French, at the peace of Aix-la-Chapelle in 1748.

The interval of peace which Germany enjoyed was not of long duration. Frederick the Great of Prussia having discovered the plots which were formed against him by the emperor, the elector of Saxony, Russia and France, and being subsidized by England, occupied Saxony, and resisted the attacks of his numerous enemies with alternate success, for the space of seven years. Peace was at length signed once more at Hubertsburgh on the 15th of February 1763. Francis I. died two years after. His son Joseph II. who had been declared king of the Romans in 1764, was proclaimed emperor after his death. His attempt to possess himself of part of the dominions of Charles Theodore, the last elector of Bavaria, who died in December 1777, disturbed the peace of Germany for a short time. No battle of any consequence was fought between the Austrian and Prussian armies; but the severe winter campaign of the latter end of 1778, and the beginning of 1779, having thinned the ranks of both, the treaty of Teschen was concluded on the 13th of April 1779, and the peace of Westphalia appealed to, and confirmed for the last time. Maria Theresa left her hereditary dominions to her son Joseph II. at her death, which happened in 1780. Frederick the Great of Prussia, who was the last pillar of the Germanic constitution, died in 1786. Ambitious of imitating the example of his illustrious opponent, Joseph II. introduced many salutary reforms in the administration of his dominions, proclaimed an unbounded religious toleration, suppressed a number of useless convents, abolished the use of the rack in criminal inquisitions, and extinguished the remains of servitude and villainage which oppressed the peasants of his dominions. But his well-intended innovations were too sudden. Discontents broke out in the Netherlands, which he vainly attempted to stifle by force instead of adopting conciliatory measures. The rebellion of his Flemish subjects broke his heart. He died childless, though he had been married twice; and his brother Leopold, grand duke of Tuscany, succeeded him on the imperial throne in 1790. His unfortunate engagement with the king of Prussia and the elector of Saxony, to oppose the French revolution with all their might, and to assist the emigrants in their attempts to re-enter France by force, hastened the violent measures of the war party in France, which ultimately led to the extinction of the German empire. He died on the 1st of March 1792. His son Francis II. was raised to the imperial throne in the middle of July following. He embarked in the confederacy formed against France, lost the Austrian Netherlands, the Brisgau, and all his possessions in Italy, and was at length obliged to abdicate the imperial throne of Germany, and to be contented with the title of emperor of Austria. See CONFEDERATION of the Rhine.

The peace of Westphalia, which had been regarded as the basis of the political system of Europe, had, in fact, sown the seeds of the dissolution of the German empire, by conferring on each prince and state of the German confederacy the privilege of contracting alliances in their own names. Their interests were continually clashing with each other. The irresistible force of revolutionary France has only accelerated a disorganization, which would infallibly have taken place, through the rivalry of the Austrian and Prussian monarchs, supported, one by the Catholic, and the other by

the Protestant states. Composed of such discordant materials, it is rather a matter of surprise that its existence as a state should have been protracted to the length of one thousand years.

The Germans never formed a nation united by the ties of similar habits, laws and religion. These differed in almost every petty principalty, and the tie of language, from its many idioms and different pronunciation, was so weak, that the national hatred of the inhabitants of the Prussian dominions against those of the Austrian states was as great as that which prevails between the English and the French. The difference between the Protestant and Catholic countries was also so considerable, that whilst farmers in the former enlivened their leisure by study, the clergymen in the latter were even ignorant of the first four rules of arithmetic. Palitzsch, a Saxon farmer, who was a fellow of the Royal Society of London, died in 1788, and six months before his death a clergyman was wanted, in the gazette of Cologne, capable of teaching the rudiments of common arithmetic. The only feature which may be marked as a national one in the Germans of all persuasions and places, is the industry and perseverance of the middle and lower ranks, and the pride and haughtiness of the nobility. As soldiers, the Germans, when ably commanded, have always shewn themselves endowed with steady courage and persevering strength. But the name of German is extinct. Henceforth the traveller must inquire into the peculiar character and disposition of the Austrian, Prussian, Saxon, Bavarian, Westphalian, and the inhabitant of Wirttemberg, Baden, Berg, Hesse Darmstadt, Nassau, and the other smaller states of the confederacy of the Rhine. I. G. Meusel's Statistics. Robertson's Introduction to the History of the emperor Charles V. Busching's Geography. Anc. and Mod. Univ. Hist. Gibbon's Decline, &c. of the Roman Empire.

GERMANY, *Upper and Lower*, in *Ancient Geography*, divisions of *Gaul*; which see.

GERMANY, in *Geography*, a town of America, in Adams' county, Pennsylvania, containing 1013 inhabitants.

GËRMEN, or GERM. See EMBRYO.

GERMEN, in *Botany and Vegetable Physiology*, the rudiments of the fruit, constituting one of the two essential parts of the pistil of a flower, the stigma being the other; the style, which usually elevates the latter, not being indispensable, nor always present. The Latin word *germen* properly means a bud, or sprout (see GEMMA); which latter, in scientific language, is now universally used in its stead. Linnæus therefore applied *germen* technically, and very happily, to the seed-bud, or origin of the future offspring, which had as yet no appropriate name. In this he is generally followed, even by the only person who could effectively have contended with him in such a point, the celebrated Jussieu. Nevertheless, Gartner, assuming some well-founded authority on account of his valuable labours respecting fruits and seeds, prefers the word *ovarium*, borrowed from anatomists, for it is not classical Latin. The only reason for this innovation is, as he is pleased to express it, that Linnæus "*visu improprio*" calls this part *germen*. The authority of Gartner has unfortunately misled one excellent writer of late to adopt the term *ovarium*, to which we object, not so much for its want of classical authority, as it might well be defended on the ground of analogy, but because it is not appropriate, and is not used by Gartner in the original anatomical sense, but in a new and arbitrary one. Vegetables have no such organ as the *ovarium* of animals. Malpighi, much more correctly, calls the *germen* the *uterus*; but this is improper for plants with naked seeds; whereas *germen* is applicable in all cases to the rudiment of the fruit, whatever its nature

any be. Such a comprehensive term is of the more value, as not having any respect to the disputable point of whether any seeds be really naked or no. We agree with Gartner that they cannot in their ordinary state, but must have some integument through which they are impregnated; see FERTILIZATION OF PLANTS. In an advanced state the famous author could not but allow the existence of naked seeds in a certain sense, that is, such as have only their own essential integuments, but no real integument or seed-vessel.

Gartner very successfully combats the Linnæan hypothesis, that the germs originate from the pith of the plant, as the stamens from the woody part. This idea was purely hypothetical, and is unsupported by any anatomical fact, however ingenious the theory of generation deduced from it by the illustrious Swede.

The germs are formed as early as any part of the flower, of which indeed it frequently constitutes the base. Before the stigma is ripe for impregnation, all the internal parts of the germen, especially the young seeds, receive their due shape and structure, except only the embryo, the rudiments of which can scarcely be detected at that period. If no impregnation takes place, the germen, and even the seeds sometimes continue to grow, but a cavity only in such case will be found in the place of the embryo, which has at least proved abortive and withered away, if it ever had any existence. More frequently indeed only the husks or withered rudiments of seeds are found in an advanced unimpregnated germen; and still more generally the whole germen withers if the stamens and stigma have not performed their office.

Germens are either solitary or numerous. Simple or aggregate, in different genera of plants. With respect to situation, it is important to note whether the germen be superior, that is, above the bases of the calyx and corolla, or inferior, below them. Such a difference commonly marks a very essential generic distinction, yet in that most natural genus *Saxifraga*, some species have a superior and others an inferior germen. This proves, on a careful anatomical investigation, to depend merely on a greater or less degree of elevation of the organ in question within the cavity of the calyx. Indeed such an investigation of flowers in general will shew that there is perhaps no such thing as an inferior germen. Strictly speaking, because there must necessarily be a continuation of the integuments of the flower and their vessels, in some form or other, along the outer part of what is commonly deemed an inferior germen, to the stalk whence their nourishment is derived. But this were to consider too curiously. The line is in almost every case drawn with sufficient distinction for all useful purposes, and is generally indicated in due time by a spontaneous separation of parts. *Sanguisorba* is erroneously judged by Linnæus to have the germen below the corolla though above the calyx, a strange and unexampled circumstance indeed! He was misled by the close adhesion of the thin pellucid tube of the corolla to the germen. In *Albica*, however, there is an approach towards such a singularity of structure, the calyx being inserted half way down, while the corolla crowns the germen, for this plant, being akin to *Saxifraga*, partakes of that irregularity of position in the germen which we have already described.

Nothing is more wonderful than that difference of vascular constitution in the germen of different genera or natural orders, by which, though in all cases nearly equally juicy while young and growing, in some it becomes coriaceous, or woody, and dry, as it ripens, while in others it attains a soft pulpy consistence, which obliterates all its original internal structure. The wide ends answered by these differences are indeed apparent, but the means by

which they are accomplished are, if not inscrutable, hitherto unexplained. S.

GERMER, ST., in *Geography*, a town of France, in the department of the Oise; 12 miles W. of Beauvais.

GERMERSHEIM, a town of France in the department of Haut Rhone, and chief place of a canton, in the district of Spire; 5 miles S. of Spire. The place contains 1251, and the canton 11,745 inhabitants, in 16 communes. It is situated at the conflux of the Q. rich and the Rhine, and was erected into a town by Rodolphus I., who died here in 1290. It was taken by the French in 1794. N. lat. 49. 12. E. long. 8. 25.

GERMINATION, in *Vegetable Physiology*, the first beginning of vegetation in seed, is accomplished by moisture, heat, and air, acting mechanically and chemically on the substance and component parts of the seed, as well as stimulating its vital principle. These agents must perform their functions together, in order to produce a salutary effect, otherwise the vital principle, or the chemical properties of the seed, may be stimulated or spoiled, nor must their application, generally speaking, be longer delayed than usually happens in the ordinary course of nature. Some seeds, indeed, may be kept out of the ground for years, or may remain buried far beneath its surface, we know not how long, without losing their vegetative power; while others must scatter themselves in their own way, immediately from the seed-vessel, in order to succeed with certainty. A seed absorbs, through the vessel of its base, or fear, any moisture that comes in its way, and it soon meets with such a supply when committed to the ground, at the same time receiving, throughout its whole substance, a definite portion of heat, some seeds requiring more than others. Atmospheric air is also necessary to the germination of seeds, on account of the oxygen gas which makes a part of its composition, and which modern chemists have found to be absorbed by seeds, in the moments of incipient germination, from or through the surrounding soil. This appears from their being incapable of vegetation while buried deep in the earth, or while under the exhausted receiver of an air-pump; though such as have been so situated immediately grow, when the atmosphere has access to that part of the soil in which they lie. By the above agents the bulk of the seed is increased, and its vital principle stimulated. The integuments burst, and the radicle, or young root, protrudes, which being most susceptible of the stimulus of moisture, for that reason (as Dr. Darwin ingeniously judged,) elongates itself in the direction where it meets with this stimulus, increasing chiefly at the extremity, and descending into the earth. It is a well-known fact that the radicle takes this direction, in whatever position the seed may happen to lie. Dr. Darwin's seems to us the best explanation of this curious law of the vegetable constitution, and preferable to any one founded on principles of mechanics or of gravitation. Accordingly, the rudiments of the young plant, consisting of the cotyledons and plumula or bud, being most stimulated by air, raise themselves out of the ground, entirely for the most part, in pursuit of it. If some few cotyledons do remain and wither under ground, it is only because they have already met with a sufficiency of air or oxygen to answer their destination. See COTYLEDONES.

During the process of incipient germination, the immediately necessary supplies of nourishment, till the young root can derive any from the soil, are furnished by the *albumen*, a substance either constituting a separate body of itself, as in grasses, corn, palms, &c., which, from a hard, dry, and tasteless mass, changes, by the action of water and oxygen, into a milky or saccharine fluid, witnefs the operation

tion of making; or the same substance is lodged in, or united with, the bulk of the cotyledons, as in the leguminous tribe. If the *albumen* happens to suffer chemical deterioration, by keeping or otherwise, the seed germinates more feebly, or not at all. Hence gardeners prefer old seeds of melons and cucumbers, as producing less luxuriant plants, and more fruit in proportion. We presume the consequences of keeping affect the chemical qualities of the albumen before the vital principle suffers, because of the success of recent French chemists, who by the copious application of oxygen restore their original nature. See this whole subject more fully detailed in the Transactions of the Linnean Society, vol. 9. p. 204—217. S.

GERMISCH, in *Geography*, a town of Germany, in the bishopric of Freyding; 21 miles S. of Weilhaim.

GERMONJO, ANASTASIO, in *Biography*, was born at Sala, in Piedmont, in 1551; his education was almost entirely neglected till he had attained the age of manhood. Feeling, at this period, his own deficiency, he applied himself with so much diligence, that in the course of a few months he felt equal to engage in the study of the law. He took his degree at the university of Turin, and was appointed to the professorship of the canon-law, an office which he held, in conjunction with other posts of honour and emolument, till his archbishop was created a cardinal; he then accompanied him to Rome, and acquired the esteem of Sixtus V. and the succeeding pontiffs. He was appointed by Clement VIII. to assist in compiling the seventh book of decretals, in which were inserted the decrees of the council of Trent, with explanations. After this he was entrusted by the dukes of Urbino and Savoy with the management of their concerns at the see of Rome. So high was his reputation, that two bishoprics were offered him which he refused, but at length accepted of the archbishopric of Tarantasia, in Savoy. He was next sent ambassador, by duke Charles Emanuel, to the court of Madrid, where he died in 1627. Besides his notes on the Decretals, and other smaller pieces on the Digest and Code, he published "De Sacrorum immunitibus Lib. tres, &c." printed at the Vatican, 1591:—"Pomeridianae sessiones in quibus Latinae Linguae dignitas defenditur," &c. His writings are highly esteemed for the purity of the language and the accuracy of the reasoning. Moreri.

GERMS, in *Geography*, a town of Austria; 62 miles W.N.W. of Vienna. N. lat. 48° 52'. E. long. 15.

GERMUK, a town of Asiatic Turkey; 45 miles W. of Diarbekir.

GERN, a town of Russia, in the government of Tula; 28 miles W.S.W. of Tula.—Also, a town of Bavaria; 15 miles W.N.W. of Braunau.

GERNACH, a town of Germany, in the principality of Wurzburg; 5 miles W.N.W. of Geroldshofen.

GERNOI, a fortress of Russia, in the government of Kolivan, seated on the Irtysh; 204 miles S.W. of Kolivan. N. lat. 51° 44'. E. long. 78 14.

GERNOIARSKOI, a fortress of Russia, in the government of Kolivan, on the Irtysh; 106 miles W.S.W. of Kolivan. N. lat. 52 30'. E. long. 77 14.

GERNORIETZKOI, a fortress of Russia, in the government of Kolivan, on the Irtysh, 180 miles W.S.W. of Kolivan. N. lat. 52 45'. E. long. 77 14.

GERNRODE, a town of Germany, in the principality of Anhalt Bemburg, in which was an abbey founded in 960, and richly endowed for ladies, by Gero, margrave of Lusatia, which was secularized in favour of the house of Anhalt, at the peace of Westphalia; 30 miles W. of Dessau. N. lat. 51° 45'. E. long. 11° 20'.

GERNSHEIM, or GERNSHEIM, a town of Germany, given, in 1822, to the landgrave of Hesse Darmstadt; 14 miles E.S.E. of Mentz.

GERNYOSZEG, a town of Transylvania, on the river Maras; 10 miles S.W. of Kerfutar.

GEROCOMIA, of *Gerocoma*, and *Gerocoma*; *Gerocoma*; a term used by the ancients for that sort of medicinal practice which treated of the proper regimen to be observed in old age.

GERODA, in *Geography*, a town of Germany, in the territory of Liebfeld, with a rich Benedictine abbey; eight miles NE. of Duderstadt.

GERODOT, a town of France, in the department of the Aube; nine miles E. of Troyes.

GEROLDSHOFEN, a town of Germany, in the bishopric of Wurzburg; 20 miles N.E. of Wurzburg.

GEROLDSTEIN, a town of Germany, in the county of Katzenelbogen; seven miles S. of Naudede.

GEROLSTEIN, a town of France, in the department of the Sarre, and chief place of a canton, in the district of Prum; 24 miles N. of Treves. The place contains 350, and the canton 2892 inhabitants, in 29 communes. N. lat. 50 16'. E. long. 6 38.

GERON POINT, a cape of Ireland, in the county of Antrim, on the east coast. W. long. 5° 50'. N. lat. 55 3'.

GERONA, or GIRONNE. Lat. *Gerunda*, a town of Spain, in the province of Catalonia, the see of a bishop, suffragan of Tarragona. This is a fortified town, of nearly a triangular form, situated on the side and at the foot of a steep mountain; the river Tar runs through it. The streets are narrow and crowded, but the houses are tolerably well built. It has several churches and convents; and its population amounts to about 14,000 persons, a fourth of which number consists of priests, monks and nuns, scholars and students. Several provincial councils have been held in this place, one in 517, another in 1068, &c. The trade of this town is inconsiderable, and its only manufactures consist of a few looms for stockings, coarse cloths, and woollen and cotton stuffs. The cathedral and collegiate churches are the two most remarkable edifices in Gironne. The treasury of the cathedral is richly furnished with chalices, crosses, shrines, relics, &c. of gold and silver set with jewels. In the Capuchin convent there is an Arabian bath, constructed in the most elegant style, and consisting of columns standing on an octagon stylobate, or low-base, encircling a reservoir to contain water. The university of Gironne, founded in 1521 by Philip II. was abolished in 1715 by Philip V. After the suppression of the Jesuits, public instruction was concentrated in one college, accommodating 900 students, who are taught the Latin grammar, rhetoric, philosophy, and theology. The library is select and extensive. Schools are kept by the community of the Beguine nuns for the gratuitous instruction of poor girls; 47 miles N.E. of Barcelona. N. lat. 42 10'. E. long. 2 35'.

GERONIMO, ST., a town of Mexico, in New Biscay; 90 miles N. of Parral.

GERONTE, a small island in the Mediterranean, near the coast of Nauplia. N. lat. 36° 20'. E. long. 30 40.

GERONTES, in *Antiquity*, a kind of judges, or magistrates, in ancient Sparta, on whom to what the Areopagites were at Athens. See AREOPAGITES.

The word is formed of Greek, *geron*, which signifies *old man*. Whence also the words *gerontia*, something belonging to an old man; and *geronikon*, a famous book among the modern Greeks, containing the lives of the ancient monks.

The senate of gerontes were called *gerusia*, that is, assembly or council of old men.

The gerontes were originally instituted by Lycurgus: their number, according to some, was twenty-eight; and, according to others, thirty-two. They governed in conjunction with the king, whose authority they were intended to balance, and to watch over the interests of the people. Polybius defines their office in few words, when he says, "πριπίσος, et cunctis omnibus adhiberati." None were to be admitted into this office under sixty years of age, and they held it for life. They were succeeded by the Ephori.

GERONTESSA, in *Geography*, a small island in the gulf of Euzia; four miles south of Eugia.

GERONTONON, in *Surgery*, a little ulcer, shaped like the head of a dart, and making its appearance occasionally on the cornea of old persons. The term is derived from γέρων, an old person, and ὄζον, a dart.

GEROPOGON, in *Botany*, from γέρων, an old man, and ὄζον, a beard, alluding to the long hoary down of the seed. Linn. Gen. 398. Schreb. 525. Willd. Sp. Pl. v. 3. 1491. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 3. 110. Juss. 170. Lamarek. Illustr. t. 646. Gertn. t. 160.—Class and order, *Syngenesia Polyzumia-aqualis*. Nat. Ord. *Composita Semiflosculose*, Linn. *Cichoraceae*, Juss.

Gen. Ch. *Common calyx* simple, of numerous upright, lanceolate, somewhat awl-shaped, keeled leaves, longer than the corolla. *Cor.* compound, somewhat imbricated, uniform; each floret hermaphrodite, with a corolla of one petal, ligulate, abrupt, five-toothed; the outer ones equal in number to the calyx-leaves, inner ones fewer and shorter. *Stam.* Filaments five, very short; anthers united into a cylindrical tube. *Pist.* Germen oblong; style thread-shaped, the length of the stamens; stigmas two, thread-shaped, recurved. *Peric.* none, except the permanent, oblong, upright, gaping calyx. *Seeds* of the circumference awl-shaped, as long as the calyx; their crown stalked, of five spreading rough bristles: those of the disk awl-shaped, but shorter, their crown feathery. *Recept.* naked.

Eff. Ch. *Receptacle* naked. *Calyx* simple, of many leaves. *Seeds* of the disk with a feathery crown; those of the circumference with one of five naked rays.

Obf. Linnæus originally described the receptacle as naked, which is confirmed by Gertner, Willdenow, and Jacquin. Afterwards he attributed chaffy scales to this part, which is adopted by Schreber, but, as we believe, without foundation. Jacquin, in consideration of the etymology, properly makes this genus, as well as *Tragopogon* and *Andropogon*, of the masculine gender.

Two certain species of *Geropogon* only are known. They have the closest natural affinity to *Tragopogon*, but differ in the bristles, not feathery, crown of their external row of seeds. The genus is merely artificial, as not at all supported by habit, nor is the difference in the crown of the seeds greater than what occurs amongst indubitable species of one genus in others of this natural order.

1. *G. glaber*. Linn. Sp. Pl. 1109. Jacq. Hort. Vind. v. 1. t. 33.—"Leaves smooth."—Native of Italy and the Levant, sometimes kept in botanic gardens for curiosity only. It is annual, with a branched stem, 12 or 18 inches high, clothed with many alternate, clasping, long, grassy, smooth leaves, each branch terminated by a small, inconspicuous, pale pink flower, like the pink hawkweed, but far less handsome. The seeds are larger and more remarkable. The herb abounds with milky bitterish juice. Nothing can be more closely allied than this plant to *Tragopogon porrifolius* of Linnæus: see Engl. Bot. t. 638.

2. *G. hirsutus*. Linn. Sp. Pl. 1109. (*Tragopogon gramineo folio*, fusc. s. bente flore; Column. Ecphr. t. 231.)—"Leaves hairy"—Found by Columna, who alone of all botanists seems actually to have seen this species in a wood of wild pear-trees near Cirinola in Italy, flowering in May. It appears to differ from the preceding, chiefly in the roughness of its leaves, which nevertheless is so precisely and forcibly indicated by Columna, that we dare not presume it not to be a sufficient distinction. All authors have adopted this plant from Columna, nor had Linnæus a specimen.

A third species occurs in recent writers, *G. calyculatus*; Linn. Syst. Veg. ed. 13. 592. (*Tragopogon calyculatus*; Jacq. Hort. Vind. v. 2. 48. t. 106.) This was received by Jacquin from Italy, and he sent a specimen to Linnæus, who referred it to *Geropogon*. The habit is that of a *Scorzonera*. *Root* perennial. *Flower-stalk, calyx,* and upper leaves hairy. *Calyx* of a double row of scales, shorter than the corolla, which is yellow. Crown of the seed slightly hairy, and, as far as we can perceive, uniform.—This is certainly no genuine *Geropogon*, and we are convinced it is the identical *Scorzonera hirsuta* of Linnæus, well figured in Columna's Ecphrasis, t. 233, though unfortunately we cannot prove it to demonstration, there being no specimen of the latter in the Linnæan herbarium. The plant in question is however the *Geropogon hirsutus* of Allioni, Fl. Pedem. v. 1. 229, as his synonyms shew, though he took it to be annual. S.

GERRARD, in *Geography*, a county of Kentucky, in America, containing 6083 inhabitants, of whom 1234 are slaves.

GERRARDS, PETER VAN ZYL, in *Biography*, a painter, born at Amsterdam in 1607. He came to England and lived in the same house with Vandyke on terms of friendship and intimacy. He studied his manner successfully, and on his return to Amsterdam was so highly thought of, as to bear the name of the second Vandyke.

GERRES, GERULI, or *Giroli*, in *Ichthyology*, names given by the Venetians to a fish common in that part of the world. It is the *finaris*, or *mana alba* of authors. Ardei very judiciously makes it a species of the *sparus*, and distinguishes it from others, by its having a black spot on each side, and the pectoral and tail-fins red.

GERRHA, Γέρρα, among the Greeks, wicker hurdles, resembling the Roman *vineæ*, which the Romans held over their heads to shelter themselves.

GERRHÆ, or GERREI, in *Ancient Geography*, a people of Scythia, in Europe, S. of the Danube.—Also, a people of Asiatic Sarmatia, not far from the Caspian sea.

GERRHUS, a river of Sarmatia, which runs into the Palus Mæotides.—Also, a river of Asia, in Albania.

GERRI, in *Geography*, a town of Spain, in Catalonia; 27 miles N. of Balanguer.—Also, a town of Africa, in Nubia, situated on the Nile; containing about 140 houses; 150 miles N.N.E. of Sennaar. N. lat. 16 15. E. long. 33.

GERRISH, a small island, near cape Neddock, close to the main land of the district of Maine, in America.

GERRY, a township of America, in the state of the Massachusetts, and county of Worcester; incorporated in 1786, and containing 14,000 acres of land, in which are 802 inhabitants; 30 miles N.W. of Worcester.

GERS, a river of France, which rises near La Barthe de Nèfles, in the department of the Upper Pyrenées, traverses the department of the Gers, and runs into the Garonne, about three miles S.E. of Agen.

GERS, one of the nine departments of the south-west, or Garonne region of France, bounded on the N. by the department of the Landes and the Lot and Garonne, on the E. by the department of the Upper Garonne, on the S. by



the departments of the Upper and Lower Pyrenées, and on the W. by the department of Landes. This department is composed of Condommois, Armagnac, and Comminges, and takes its name from the river which crosses it from south to north. Its capital is Auch. It is situated in N. lat. 43° 40'; its territorial extent is 7,047½ kilometres, or about 339 square leagues, and the number of its inhabitants is estimated at 291,845. It is divided into five districts, *viz.* Condour, containing 67,103 inhabitants, Leffonne, with 57,445, Auch, having 52,825, Lombes, with 37,393, and Mirande, with 77,079 inhabitants. The number of its cantons is 30, and of its communes 700. The total of its contributions, personal, sumptuary, and on moveables and immoveables, &c. is 2,663,310 francs, and the expence of administration, justice, and public instruction, is 278,498 francs. The soil of this hilly department is indifferently fertile, yielding moderate crops of grain, wine, fruits, and good pastures.

GERSA, or GAIRSA, an island of Scotland, five miles E. of Enhallow, two S. of Weir, and one E. of Mainland, is two miles long and one broad, and contains 50 inhabitants. The greatest part consists of a conical hill; steep on the W. side, and towards the E. more plain and fertile. The only harbour is that of Millburn on the E. coast. See GAIRSA.

GERSAU, or GERISAU, a village or town of Switzerland, at the foot of the Rigi, and the smallest republic in Europe. Its territory is about a league in breadth, and two leagues in length; situated partly on a small neck of land at the edge of the lake of Schweitz, and partly lying upon the rapid declivity of the Rigi. It contains about 1200 inhabitants, having their general assembly of burgeses, their landamman, their council of regency, their courts of justice, and their militia. In the whole republic there is not a single horse; and the only way of arriving at the town is by water, excepting a narrow path down the steep sides of the mountain, which is almost impassable. Gerisau is entirely composed of scattered houses and cottages of a very neat and picturesque appearance; each dwelling is provided with a field or small garden. The inhabitants are much employed in preparing silk for the manufactures of Basle. This little republic is under the protection of the four cantons, Lucern, Uri, Schweitz, and Underwalden; and in case of war furnishes its quota of men. The town is six miles distant S.W. from Schweitz. N. lat. 46° 55'. E. long. 8° 20'.

GERSCHITZ, a town of Bohemia, in the circle of Konigingratz; nine miles N.W. of Konigingratz.

GERSCHNITZ, a town of Germany, in the principality of Bayreuth; six miles E. of Bayreuth.

GERSDORF, a town of Germany, in the principality of Querfurt; four miles N.E. of Juterbock.

GERSON, in *Biography*, chancellor of the church and university of Paris at the beginning of the fifteenth century; according to whom the ground-work of all discant was the plain-chant; and in his treatise upon the education of children for the choir of Notre Dame, he enjoins a particular attention to chanting, counterpoint, and discant, as the three most essential branches of their instruction and study. (*Magister cantus statutus horis docet pueros planum cantum principaliter, et contrapunctum, et aliquos discantus honestos—decent et sobri melodias.*) He likewise tells us, that in this cathedral, during his time, the choirillers were only allowed, by the statutes, to practise discant till their voices broke. (*Nec faciat eos tantum insistere in talibus, quod perdat in grammatica profectum; attento maxime quod in ecclesia nostra discantus non est in usu, sed per statuta prohibitus, saltem quoad voces quæ mutata dicuntur.*) The Abbé Lebeuf understands these last words as we have translated them: (*Le discant n'étoit point en usage dans l'église de*

Paris, et qu'au contraire il étoit défendu par les statuts, au moins à l'égard des voix qui avoient passé le tems de la mutation. *Traité Hist. sur le Chant. Eccles. p. 92.*) The indefatigable Abbé Lebeuf found in the king of France's library the statutes here alluded to, which had been framed in the 13th century, and from which the chancellor had been ordered to make extracts in 1408. He concludes the fourth article of his tract, which relates to psalmody, by informing us that no written discant was allowed in church missals or graduals, except for the exercise and improvement of the singing boys. (*Nec debet in cantu notulato regulariter immisceri discantus, pueris exceptis propter exercitationem suam.* Gerson, tom. iv. ultime edit. p. 717.)

GERSPACH, in *Geography*, a town of Germany, in the county of Eberstein, on the Murg; taken by the French in 1794; three miles S.E. of Baden. N. lat. 48° 48'. E. long. 8° 20'.

GERSPRINTZ, a town of Germany, in the county of Erbach; seven miles N.W. of Erbach.

GERSTEN, CHRISTIAN LOUIS, in *Biography*, was born at Giessen in 1701: here he was educated, and in the year 1733 he was appointed professor of mathematics and the-mechanical sciences in that city. On account of some dispute he was dismissed from his office, and left Giessen in 1744; he went first to Altona, and from thence to Peterburgh; but meeting with no encouragement, he returned and attempted to get reinstated in his office, but failing in his design, he insulted the landgrave, was arrested at Frankfort in 1748, and doomed to perpetual imprisonment in the castle of Marburg, with an annual allowance of 200 florins. Here he employed himself in teaching the mathematics to those young persons who came to his prison for instruction, and his leisure moments were occupied in studying the phenomena of the atmosphere, and the changes which take place in it, so as to become very expert in the science of meteorology. In the year 1760 he was liberated from his confinement, but his freedom was not complete; he was admitted at large for a time by way of proving whether he was entitled to a general discharge: escaping however from his shackles he went privately to Frankfort, where he kept himself concealed, or at least quiet, till he died in 1762. His works were numerous, and written in the Latin language: they chiefly relate to meteorology, to the methods of calculating eclipses, and to the structure of astronomical instruments. He was esteemed by his contemporaries for his integrity and his learning. He sent some papers to the Royal Society of London, of which several were inserted in the volumes of their Transactions. Moreri.

GERSTUNGEN, in *Geography*, a town of Germany, in the principality of Eisenach, on the Werra; 8 miles W. of Eisenach.

GERSWALDE, a town of Germany, in the Ucker Mark of Brandenburg; 9 miles S. of Prenzlau.

GERTHAUSEN, a town of Germany, in the county of Henneberg; 10 miles W. of Meinungen.

GERTRUDENBERG, a town of Germany, in the bishopric of Osnabruck; 1 mile E. of Osnabruck.

GERTRUYDENBERG, St., a town of Brabant, but in later times subject to Holland, with a good harbour, formed by the Merwe, which here extends to a considerable lake, called "Bies Bofsch," over which is a passage of two hours to Dort. It is built in the form of a crescent, with regular fortifications, good bastions, and forts with sluices; by means of which they can lay the adjacent country under water. In ancient charters it is called "Mons Littoris," the mountain of the shore. In 647, Pepin de Landen, duke of Brabant, gave it to his daughter Gertrude, who

built a church dedicated to St. Amand, bishop of Tongres; but the place afterwards becoming celebrated by the death and pretended miracles of St. Gertrude, it has since been called "Mont de St. Gertrude," or Gertrudenberg. The castle was built in 1321. After passing through many vicissitudes, it was summoned by the French in February 1793, and taken; but soon after evacuated. The French took it again in 1795. It is distant 10 miles S.E. of Dort, and 7 N.E. of Breda. N. lat. 51 40'. E. long. 4 44'.

GERTZ, a town of Germany, in the principality of Wurzburg; 5 miles W.S.W. of Munerstat.

GERVAIS, ARMAND FRANCIS, in *Biography*, was born at Paris about the year 1660; he was educated with the Jesuits, and at fifteen years of age he entered among the bare-footed Carmelites. At the age of twenty-two he was appointed by his superiors to teach theology to the younger members of the order; and he was at the same time distinguished as a pulpit orator. Some years after this he withdrew into the monastery of La Trappe, where he successively filled very important offices belonging to that order. The changes which he introduced, and the reforms which he meditated, created an alarm; and in 1698 he resigned his offices, and quitted his residence in the monastery. From this period he wandered about, from solitude to solitude, following the same affective course of life which he had been in the habit of practising in the college. Having, in 1745, published the first volume of an interesting "General History of the Cistercian Order in France," in which was a severe attack upon the Bernardines, he was arrested and imprisoned in the abbey of Notre Dame des Reclus, in the diocese of Troyes, where he died in 1751, at the age of ninety-one. He published, besides the work alluded to, "The Life of St. Cyprian," with an abridgment of his works, including notes and dissertations; "The Lives of Peter Abelard and of his wife Heloise;" "The History of Suger, Abbot of St. Denys," in three volumes, 12mo. "The Life of St. Irenæus," in two vols. 12mo. Also lives of St. Paul, Epiphanius, Rufinus, and other eminent persons. He was distinguished as a controversialist, and was the opponent of Father Courayer on the subject of English ordinations. He is characterized as a man of great learning and singular virtues, but his manners were austere, impetuous, and forbidding. Moreri.

GERVAIS, *St.* in *Geography*, a town of France, in the department of the Puy de Dôme, and chief place of a canton, in the district of Riom; 15 miles N.W. of Riom. The place contains 2180, and the canton 9204 inhabitants, on a territory of 282½ kilometres, in 11 communes.

GERVAIS-de-Maffey, *St.* a town of France, in the department of the Orne, and chief place of a canton, in the district of Domfront; 9 miles N. N. E. of Domfront. The place contains 1068, and the canton 17,228 inhabitants, on a territory of 132½ kilometres, in 14 communes.

GERVAIS-la-Ville, *St.* a town of France, in the department of Herault, and chief place of a canton, in the district of Beziers. The place contains 1263, and the canton 8641 inhabitants, on a territory of 137½ kilometres, in 10 communes.

GERVASE of Tilbury, in *Biography*, an historian of the thirteenth century, a native of Tilbury, in Essex, and nephew to King Henry II. He was, through the interest of Otho IV. made marshal of the kingdom of Arles. He wrote a commentary on Geoffrey of Monmouth's British History, and also a tripartite History of England. His other works are "A History of the Holy Land;" "Origines Burgundionum;" "Mirabilia Orbis," and a Chronicle; entitled "Imperialium Otiorum." The compilation of the ex-

chequer book, entitled "Liber Niger Scaccarii," was ascribed to him; but Mr. Madox, who published a correct edition of it, gives it to Richard Nelson, bishop of London. Moreri. Gen. Biog.

GERVASIO GATH, the nephew of Bernardo; was also a painter of considerable merit in the same style of colouring, as is evident in a picture of St. Sebastian, in the church of St. Agatha at Cremona, where it is united to the design of the antique; and also in the Martyrdom of St. Cecilia, at St. Pietro, in the same city.

GERVASO, Sr. in *Geography*, a town of Italy, in the department of the Mela; 15 miles S. of Brescia.

GERUMA, in *Botany*, barbarously corrupted by Forskall from an Arabic name *Djerrum*. Forsk. Ægyptiaco-Arab. 62. Juss. 264. Linsæus. Dict. v. 2. 702.—Class and order, *Pentandria Monogynia*. Nat. Ord. "*Melia*, or perhaps *Malvacea*," Juss.—"*Rhamnii*?" Lamarek.

Gen. Ch. Cal. Perianth inferior, of one leaf, flat, five-toothed, small, green, permanent. Cor. Petals five, lanceolate, abrupt, spreading, thrice as long as the calyx, white. Nectary, a thick ring surrounding the germen, bearing the stamens on its outer edge. Stam. Filaments five, erect, half the length of the corolla; anthers erect, triangular. Pyl. Germen globose, deeply immersed in the nectary; style thread-shaped, small; stigmas three, widely spreading, red, wedge-shaped, emarginate at the extremity. Peric. Capsule superior, oval, of four, or perhaps five, cells, and as many valves. Seeds, two in each cell, oval, inserted into a triangular white pulp; one of them often abortive.

Ess. Ch. Calyx with five teeth. Petals five, abrupt. Nectary, a ring round the germen. Stigmas three, emarginate. Capsule superior, ovate, of four or five cells. Seeds two, affixed to a pulpy receptacle.

1. *G. alba*. Leaves alternate, oval-oblong, somewhat serrated.

This is all that can be gathered from Forskall's account, and it forms a botanical enigma. Some circumstances indicate an affinity to Jussieu's *Euphorbia*. The accounts of the stigmas and of the fruit are the most remarkable. Nothing is said of the habit, duration, or sensible qualities.

GERUND, in *Grammar*, a sort of tense, or time, of the infinitive mood: very like to the participle, but indeclinable.

The word is formed of the Latin *gerundivus*; and that from the verb *gerere*, to bear.

The gerund expresses not only the time, but also the manner of an action; as, he fell in running post.

It differs from the participle, in that it expresses the time, which the participle does not. And from the tense properly so called, in that it expresses the manner, which the tense does not.

Grammarians are much embarrassed to fettle the nature and character of the gerunds: it is certain they are no verbs, because they do not mark any judgment or affirmation of the mind, which is supposed to be the essence of a verb: and besides, they have their several cases, which verbs have not.

Some, therefore, will have them to be adjectives passive, whose substantive is the infinitive of the verb: on this footing they denominate them verbal nouns, or names formed of verbs, and retaining the ordinary regimen thereof.

Thus, say they, *tempus est legendi libros*, or *librorum*, is as much as to say, *tempus est se legere libros*, vel *librorum*. But others dispute this decision.

The Greeks have neither gerunds nor supines; but instead of

of them they make use of the infinitive, in the same manner as the French; *πρὸς τὸ πίνειν, pour boire*. When the article happens to be made use of, then its genitive is put for the gerund in *di*, as *τὸ ποῖναι, faciendi*, of doing; the dative or ablative *τω* is put for the gerund in *do*; and the neuter for the gerund in *dum*. But the infinitive in this sense is often expressed without the article, as *\*Ἀρχὸς ἀκονίζων, jaculandi peritus*, an excellent archer; *Δίδωι φέρον, ferendum dedit*, he gave it to carry. In Greek, however, the termination *τιον* corresponds to the Latin gerunds; thus, from *λέγω*, to say, is deduced *λεξιόν, dicendum*, it must be said. These verbal adjectives, as they may be called, sometimes denominated gerunds, are used occasionally either in an active or a passive sense; *πνεύνη δεξαμενῶν*, it is for thee to cultivate the ground: *τῆ γυναικὸς ὑπερτείνῃ ἔπειτα το σώματι, καὶ ὑποτασσῇ συν ποιοῖσι καὶ ἰδέσθῃ*, the body should be accustomed to obey the understanding, and be disciplined with toils and sweat. Xenophon.

An ingenious grammarian observes, that the Latin gerunds in *di*, *do*, and *dum*, are but the participle in *dus* in the oblique cases; and as this is taken from the present participle, they have its sense, namely, an *active* sense. On the same principle that participles express *powers* or *habits* in action, and their tendency is to signify those powers, and not their *operation*, *i. e.* to become abstract nouns; the oblique cases of the participle in *dus*, when alone, become in their nature abstract nouns. Hence gerunds, being thus nouns in reality, are governed like other nouns in the genitive, dative, accusative, and ablative, either with or without a preposition; as *ratio scribendi*, the art of writing; *charta utilis scribendo*, paper is useful for writing; *promptus ad audiendum*, ready for hearing; or to hear; *memoria excolendo augetur*, the memory is increased by cultivating. Gerunds also, having the nature of nouns, may govern a genitive; as *facultas agrorum suis latronibus condonandi*, the power of the bestowing of his lands on his thieves. The gerunds, however, as retaining in a degree their verbal character, govern the case of their respective verbs, as *vivendi domum potestas, venit ad recipiendum pecunias, parcendo victis*. As adjectives assume the nature of nouns when used alone in the neuter termination, so the gerunds in *dum*, the neuter of participles in *dus*, become substantives, denoting, with *est*, necessity or obligation, as *vivendum est mihi recte*, living well must be to me, or I must live well. Jones's Grammar of the Latin Tongue, 1800.

GERY, ST. in *Geography*, a town of France, in the department of the Lot, and chief place of a canton, in the district of Cahors, 5 miles N. W. of Cahors. The place contains 1250, and the canton 6735 inhabitants, on a territory of 180 kilometres, in 9 communes.

GERYON, a name given by some of the affected chemical writers to quicksilver.

GERZAT, in *Geography*, a town of France, in the department of the Puy de Dôme; 4 miles N. E. of Clermont.

GERZEN, a town of Bavaria; 11 miles E. of Landshut.

GESAN, a town of the Arabian Irak; 8 miles S. E. of Mendali.

GESAS, a town of Silesia, in the principality of Neisse; 3 miles S. E. of Patzchau.

GESEKE, a town of Germany, in the kingdom of Westphalia; 9 miles E. S. E. of Lipiladt.

GESERICH, a lake of Prussia, in Oberland, near Dutch Eylau.

GESERVAGHERD, a town of Persia, in Chorasan; 30 miles S. of Esfenan.

GESHEN, *Rocks and rivers of*. See AMILARA.

GESHURITES, in *Scripture Geography*, a people who dwelt beyond Jordan, in the half tribe of Manasseh.

GESIS, in *Geography*, a town of Germany, in the county of Feldkirch; 4 miles E. of Feldkirch.

GESKENDORF, a town of Prussia, in Oberland; 7 miles S. S. E. of Salfeldt.

GESMOLD, a town of Germany, in the bishopric of Osnabruck; 12 miles S. E. of Vorden.

GESNER, CONRAD, in *Biography*, "the greatest naturalist the world had seen since Aristotle," the first discoverer of the only true principles of botanical arrangement in the flower and fruit, "to which the very existence of botany as a science is owing," was born at Zurich in 1516. Like most of those who have rendered the most eminent services to science or their fellow-creatures, he had to contend with the greatest difficulties, especially with poverty in his youth, and with a feeble and sickly constitution to the day of his death. He very early imbibed an ardent love of plants from his mother's brother, named Friccius, and this seems to have led him to the study of animals, and even of fossils. He was educated for the medical profession, which he subsequently practised in his native town, and to the emoluments of which he was indebted for the means of pursuing and promoting, by various expensive means, his darling studies. He founded and supported a botanic garden; kept a painter and an engraver in wood constantly in his service, and acquired a very extensive library. He exercised the pencil himself with great success, to which the excellence of the botanical cuts he has left us, with respect to the habit as well as fructification of plants, is owing. Many of these appear in the *Epitome* of Camerarius, and a large collection of the whole has been published in more recent times by Trew and Schmiedel, printed from the original blocks. Gesner undertook various laborious journeys in pursuit of plants, especially on the Alps; and while he was, perhaps, the most learned naturalist of his own or any age, he rivalled the most experienced of his contemporaries in practical observation. He united to the investigation of the external characters of plants, the most assiduous attention to their medical properties, and his own health and life were frequently endangered by the experiments he made for the good of others. He was reported to have killed himself with a dose of two drams of the root of *Doronicum*, but though his stomach was at first debilitated, he speedily recovered, and amused his friends with a narrative of his case. At length this great man fell a victim to the more immediate duties of his profession, having caught the plague, of which he died on the 13th of December, 1565, aged 49. When he found his end approaching, he requested to be carried into his museum, where he expired amid the monuments of his labours, thankful for what he had been able to accomplish, and supported by all the pious hopes and consolations of a Christian philosopher. His piety and benevolence were no less eminent than his talents. He was the general benefactor among such of his literary acquaintances as were more irascible or less candid, and he laid aside, for a while, his own immediate employments, to devote his services to the family of a deceased friend, Moiban, whose work on Dioscorides he supervised, and published for their edification. He was much attached, by similarity of taste, to Valerius Cordus, who died in 1544 at Rome, on his travels, at the early age of 29, and whose "Historia Plantarum" was subsequently edited by Gesner. These able botanists had never had a personal interview, and Gesner was more intimately acquainted with a young man named David Kyber, who died, at nearly the same age, of the plague at Strasburgh in 1553, and whose "Lexicon Rii Herbarie Trilingue" (Latin, Greek, and German) he pub-

lished the same year, with a very affectionate and consolatory epistle to the father of the author.

The principal works of Conrad Gesner are the following, not to mention various little treatises relating to Botany, or to the *Materia Medica*, which from time to time came from his ready and prolific pen, some of them accompanying the books he edited for other people.

"*Bibliotheca universalis*," or a catalogue of Latin, Greek, and Hebrew books, printed at Zurich, 1545, in one volume folio, with criticisms, and often specimens of each. This seems to have given Haller the idea of his own "*Bibliotheca Botanica*," and "*Bibl. Anatomica*."

"*Historia Animalium*," comprised in five books, making three great folio volumes in a very small type, with numerous wooden cuts. The first was published at Zurich in 1551, the last in 1587, after the decease of the author. There is also an edition in German. This is a vast compilation, and critical revival of all that had been done before him in Zoology, with every thing that he could say of his own knowledge to illustrate the subject, and many incidental botanical, as well as medical remarks. Instead of being the work of a physician, who raised and maintained himself by his practice, and who was cut off in the middle of a most active and useful life, one would suppose it the labour of a recluse, shut up for an age in his study, and never diverted from his object by any other cares. This work is arranged according to the plan of Aristotle, only the oviparous quadrupeds are separated from the viviparous. It does not extend to insects or shells. The former however had not escaped the attention of Gesner, for his labours respecting them make a part of the work of Mouffet, entitled "*Insectorum sive Minimorum Animalium Theatrum*," published at London in 1634, the earliest book on entomology.

The "*Icones Animalium*," with their nomenclature, form a separate publication from the above, consisting of the wooden cuts and names only.

"*Aquatilium Animantium Enumeratio juxta Plinium*," a little 8vo. printed at Zurich in 1556. A list of the German and English names is subjoined.

A little work in Latin, "*De Lacte*," treating of milk and its preparations, from various authors. Zurich, 1541, in 8vo.

"*De Secretis Remediis Thesaurus*;" a Pharmacopœia, which has gone through a number of editions in various languages.

"*De raris et admirandis herbis, quæ sine quod noctu luceant, sive alias ob causas, Lunariæ nominantur*." A curious and learned little work, with wooden cuts, in 4to. Zurich, 1555. It is accompanied with a description of the celebrated mount Pilat, or *Mons Prælius*, the northern extremity of the Alps, which Gesner visited in 1555. Several alpine plants are here, for the first time, noticed.

"*De omni rerum Fossilium genere*." Zurich, 1565, 8vo. Also "*De rerum Fossilium, Lapidum et Gemmarum maxime figuris*," with wooden cuts, more curious than useful.

The botanical remarks relative to the scientific arrangement of plants, on which the supereminent merits of this great man are founded, are chiefly to be gathered from his letters, which were published after his death. From the number of wooden cuts, and of drawings, which he had prepared, it is probable he meditated a general botanical work, the future arrangement of which frequently occupied his thoughts, and prompted many of these letters.

Gesner married at the early age of 20, for which he was accused of imprudence, but it does not appear that he had any reason to repent. His wife survived him, and notwith-

standing the dangerous nature of his disease, which was accompanied with a pestilential carbuncle, she did not desert his death-bed, for he expired in her arms. He left no offspring. His remains were honourably interred, the day after his decease, in the cloister of the great church at Zurich, near those of his intimate friend, Frysius, who died the preceding year. Abundance of Latin, and some Greek verses, were composed to his honour, and his life, written by his countryman Josias Simler, was published in the ensuing year. From this work, and Haller's *Biblioth. Bot.* much of the above information is derived. Haller mentions Gesner as probably the first person who, being short-sighted, found the advantage of concave glasses. S.

We have received the following additional account of C. Gesner, in relation to his medical profession.

His father, who was a worker in hides, was killed in the Swiss civil war, and left him in such poverty, that he went to Straßburg, and entered into a situation as a servant. His master, having observed his great inclination to reading, allowed him to employ the time, which was not absolutely necessary to his service, in study; and he made such progress while at Straßburg, that, having acquired a little money, he went to Paris, where he first attained an ample knowledge of the Latin and Greek languages, and of rhetoric, and afterwards applied to the study of philosophy and medicine: but as he soon found the means of subsistence fail, he was under the necessity of returning to his native country, and of teaching the languages and philosophy for a livelihood. This expedient was successful, and even procured him the means of visiting Montpellier, where he resumed the study of medicine, which he completed, by taking the degree of doctor at Basil in the year 1540. He then determined to settle at Zurich, where his merit procured him the appointment of professor of philosophy, and he discharged the duties of that office, with universal reputation and esteem, during twenty-four years. These duties, and his studies in the closet, prevented him from entering largely into the practice of medicine; in which, however, his extensive knowledge furnished him with such numerous resources, that his practice was extremely successful, and he rose superior to the prejudices of his contemporaries. Gesner had always a decided predilection for the study of botany, which he early conceived and retained through life, as we have already mentioned in the former part of this article. It was not without great trouble and difficulty that he became a scientific man; for he was of a delicate and sickly constitution; but his spirit and courage gave him strength to support the fatigues of body and mind. Notwithstanding the delicacy of his habit, he traversed the Alps in search of plants; and among other journeys over those mountains, he made one with Jean Baulin in 1561. He even culled plants from the waters, and has been known to plunge into the lake of Zurich to procure those which grew there. Ever animated by the same spirit, he visited Paris again, travelled through the southern provinces of France, and thence passed into Italy. In order to study the nature of fishes, he went to Venice with a view to investigate those of the Adriatic, and sometime afterwards he repaired to Straßburg to examine those of the Rhine. From these sources of information, from a constant personal observation, conjoined with the study of the writings of the ancients, he obtained the means of accomplishing that immensity of treatises, which a man, who only attained to 49 years of age, could hardly be supposed capable of producing.

GESNER, JOHN MATTHIAS, was born at Roth, in Anspach, in 1691, where his father was a clergyman. He received the first part of his education at the gymnasium of Anspach, and

and was quickly distinguished by his progress in the ancient and oriental languages. From Anspach he went to Jena, where he exhibited his learning and talents in several publications. In 1715 he was appointed co-rector of the gymnasium of Weimar, and keeper of the public library. In 1730 he accepted of the rectorship of Thomas's school at Leipzig, and on the establishment of the university of Gottingen he was invited to be the professor of rhetoric, an office in which he was so greatly distinguished, as to acquire the reputation of being the most able philologist of the age. He was at the same time made librarian and president of the German society, and to his inspection all the schools of Gottingen were given. On the appointment of the Royal Society at Gottingen he was the first member of the historical class, and was afterwards appointed a counsellor of state, and perpetual director. He died in 1761. His works are much too numerous to be named in this place, but they were such as to entitle him to almost the highest rank in the literary world. Among others may be noted his "Index etymologicus Latinitatis;" and his "Thesaurus Latinæ Linguæ et Eruditionis Romanæ," 4 vols. fol. Gesner, in this elaborate work, followed the order of Stephanus, but added such notes and other improvements as appeared necessary. These additions consist chiefly in the number of remarkable phrases and passages from the Roman classics with illustrations. Gen. Biog.

GESNER, SOLOMON, was born at Boleslau, in Silesia, in the year 1559. Having received the early part of his education at his native place, he was sent to Breslaw to pursue the studies necessary to his future profession. From this place he went to Strasburg, where he was so fortunate as to obtain an academic exhibition for five years, which he employed in the study of philosophy, the mathematics, and the learned languages, as well the Hebrew, Chaldee, and Syriac, as those of Greece and Rome. He now became private tutor to a noble Livonian, and when he was 24 years of age he was admitted the degree of M. A. In 1592, he was invited to fill the theological chair in the university of Wittemberg, and almost immediately entered upon the duties of his office, and was at the same time admitted to the degree of D. D. He also occupied the important posts of dean and rector of the university, assessor in the ecclesiastical consistory, and first preacher in the church. His close application to business injured his health, and he fell a sacrifice to a complication of disorders in 1605, when only in the 46th year of his age. His works are a Latin translation of "The Prophecy of Hosea," "Disquisitions on the Psalter," treating of the dignity, the use, the argument, and the connection of the Psalms, and many other works of a theological and controversial nature. Gen. Biog.

GESNER, JOHN, a canon of Zurich, and professor of natural philosophy and mathematics in that university, probably belonged to the same family as the great Conrad. He was the intimate friend of Haller, in whose society he studied at Leyden and Baile, and with whom he maintained a close correspondence during the life of that distinguished man. Their taste for botany was the same, and their characters similar. His letters make an interesting part of the "Epistolæ ad Hallerum," and abound with solid and curious botanical criticism and information. He paid much attention to the cryptogamic class, and other difficult branches of the science, as well as to the anatomy and physiology of plants. He survived his learned friend 12 years, dying in 1700, at the age of 81.

This author published two physiological dissertations on plants in 1740 and 1741, reprinted at Leyden in 1743, along with Linnæus's "Oratio de peregrinatione intra

patriam." In these he treats of the life and structure of vegetables, their propagation, sexes, elastic motion of some of their stamens, and their methodical classification. He reviews the experiments and observations of Leeuwenhoeck, Malpighi, Grew, Hales, &c. announces the then novel system of Linnæus, whom, with a kind of prophetic spirit, he calls "a man destined to reform all natural history." These dissertations are the best and most compendious epitome possible of all the botanical science of that day, in which the improvements of each writer are set in the most just and instructive point of view for their mutual illustration.

With all his knowledge, the subject of our present article, and even his friend Haller, were imposed on by one of the grossest deceptions. A person presented him with a common meadow Crowfoot, on some branches of which were stuck flowers of the common Daisy. He immediately published, in 1753, a learned dissertation on vegetable monsters, entitled "de Ranunculo bellidifloro," in which he exhibits a figure of this strange anomaly. As Haller had given his sanction to the discovery, botanists could scarcely suppose it was an evident mistake, till sir Joseph Banks obtained the original specimen after Gesner's death. On its being softened with boiling water, in the presence of several botanists, amongst whom was the writer of this, the stem of the *Ranunculus* came out of the base of the daisy, as from a sheath; and indeed the different pubescence of each was very distinguishable before their separation. A history of the whole is given by Mr. König, in his *Annals of Botany*, v. i. 368, with a plate drawn for sir Joseph Banks by Mr. Bauer, and signed by all the witnesses.

Gesner published at different times eleven dissertations in quarto, from 1759 to 1773, under the general title of "Phytographia Sacra." Some of the latter only are illustrative of the plants of scripture, the rest being of a general nature, containing various anatomical and physiological, as well as botanical and economical matter. He adopts the Linnæan system, and furnishes many remarks confirming the sexual doctrine.

He meditated a very extensive work on the characters of plants, for which he had prepared a considerable number of exquisitely engraved, though too much crowded, plates, some of which are in our hands; but this publication never took place.

He wrote also on extraneous fossils, and composed an index to Weinmann's *Phytographia*, printed in 1787 in 8vo. A catalogue of his library for sale was published in 1798, by which it appears to have been one of the best collections of botanical books ever offered to the public. S.

GESNERIA, in *Botany*, named by Plumier in memory of the great Conrad Gesner; see that article. Linn. Gen. 308. Schreb. 404. Willd. Sp. Pl. v. 3. 230. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 2. 331. Juss. 165. Plum. Gen. 27. t. 9. Lamarck Illustr. t. 536. Gærtn. t. 177.—Class and order, *Didynamia Angiosperma*. Nat. Ord. *Personate*, Linn. *Campanulacea*, Juss.

Gen. Ch. *Cal.* Perianth of one leaf, superior, in five deep, acute segments, permanent. *Cor.* of one petal, incurved and recurved; tube thickish, with a contraction at the neck and a funnel-shaped throat; limb five-cleft, obtuse, its upper segments concave, or erect, the three lower flat and spreading. *Stam.* Filaments four, mostly shorter than the corolla, two longer than the others; anthers arrow-shaped, simple. *Pist.* Germen inferior, depressed, roundish; style thread-shaped, parallel to the stamens; stigma capitate. *Peric.* Capsule roundish, crowned with the spreading calyx, imperfectly two-celled, the partition being longitudinally interrupted.

interrupted in the middle. *Seeds* very numerous, minute. *Receptacles* attached to the partition at each side.

Elf. Ch. Calyx five-cleft, crowning the germen. Corolla incurved and recurved. Capsule inferior, imperfectly two-celled. Seeds numerous.

Obs. We prefer, with Linnæus, the name *Gesneria* to *Gesneria*, as the most correct in its construction, and supported by the best analogies, though Plumier originally wrote the latter. In such cases it is needless to burthen the reader with precise quotations, and we merely adopt the orthography that appears the best, except there be any difference worth commemorating.

Linnæus has given but three species of this genus, to which Swartz has added seven new ones, besides the Linnæan *Cranicharia fruticosa*, in his Prodrômus Fl. Ind. Occ. where he also made the *Cyrtilla* of L'Heritier a *Gesneria*; see CARILLA. But in his Fl. Ind. Occ. 1032 he submits to the opinion of those who reckon it distinct. All the *Gesneria* are of West Indian origin, and very little known in Europe, except the *tomentosa*, kept in botanic gardens for its rarity rather than beauty. Several of the species first described by Swartz are eminently handsome, and well deserve to be introduced into our stoves, especially his *ventricosa*, which bears tubular curved scarlet flowers, with projecting filaments, like some of the finest *Erica*. All the species are shrubby, except *G. pumila* of Swartz, whose leaves resemble a *Primula* or *Ajuga*, and *G. acaulis* of Linnæus, Sp. Pl. 850. (*Rapunculo affinis*, &c. Sloane Jam. v. 1. t. 102. f. 1.) Both which are herbaceous, and scarcely rise above the ground. The leaves in all are simple, alternate, mostly stalked, more or less crenate, toothed, or serrated, rough or smooth. Flowers corymbose, mostly on a long common stalk. Corolla variously shaped in different species, but always more or less curved, from above one to two inches long. They chiefly grow in rocky, shady, mountainous places in Jamaica, or in Hispaniola. Full descriptions of all that Dr. Swartz has observed may be found in his Fl. Ind. Occ. v. 2. 1015—1031.

GESORIACUM, in *Ancient Geography*, a town of Gaul, belonging to the Morini; now *Boulogne*.

GESSENE, in *Geography*, a town of Bohemia, in the circle of Boleslau; nine miles N. E. of Turnau.

GESSERT, QUAMDIU. See QUAMDIU *se bene gesserit*.

GESSES is the furniture belonging to a hawk. See JESSES.

GISSI, FRANCESCO, in *Biography*, a favourite disciple and imitator of Guido Rheni in the art of painting, some of whose works are little inferior to those of his master, and are often sold for his. He is generally known by a want of fulness of execution, and of energy in his actions.

GISSIGO POINT, in *Geography*, a cape of Ireland, in the county of Sligo, at the northern extremity of Sligo bay. N. lat. 54° 22'. W. long. 8° 33'.

GISSO, a town of Naples, in Abruzzo Citra; 15 miles N. E. of Civita Borella.

GISSOPS, a town of the state of Maryland, in America; eight miles E. S. E. of Fort William.

GISSOR, a name used by some of the Arabian writers for galbanum.

GIESTA, in *Geography*, a town of Sweden, in West Gothland; 23 miles N. E. of Uddevalla.

GIESTATION, UTERINE, or *utero-gestation*, in *Midwifery*, the bearing or containing a fœtus in the womb. See CONCEPTION.

GIESTATION is also a term in the *Ancient Medicine*, used for a sort of exercise, by us called carriage.

It consisted in making the patient ride on horseback, or

in a chariot, or a boat; or even in rocking him in his bed, if he could not endure a more violent agitation.

Aesclepiades first brought frictions and gellation into practice. The design of gellation was to recover strength, after a fever, &c. was gone.

GIESTE, in *Geography*, a town of France, in the department of the Mayne and Loire; 12 miles N. W. of Chollet.—Also, a river of Germany, which runs into the Weser, near its mouth; called also *Geisle*.

GIESTICULATION, the making of affected, indecent, or unsuitable gestures, or even of proper ones in too great number. Gesticulation is a grievous fault in an orator.

GIESTINEN, in *Geography*, a town of Switzerland, in the canton of Uri; 15 miles S. of Altorff.

GIESTRICIA, a province of Sweden, about 51 miles long and 10 wide; bounded on the N. by Helsingland, on the E. by the gulf of Bothnia, on the S. by Upland, Westmanland, and Dalecarlia, and on the W. by Dalecarlia. The inhabitants do not concern themselves with agriculture, but derive their chief support and wealth from mines, forges, forests, lakes, and rivers. The capital of this province is *Geisle*, which see.

GIESTU *et fama*, in *Laete*, an ancient writ, where a person's good behaviour was impeached; now out of use.

GIESTUNGSHAUSEN, or GESHAUSEN, in *Geography*, a town of Germany, in the principality of Coburg; seven miles E. of Coburg.

GIESTURE, a motion of the body, intended to signify some idea or passion of the mind.

Quintilian defines *gesture*, *totius corporis motus & conformatio*. Gestures are a kind of natural language, which supplies the use of speech in those naturally dumb. The mimes and pantomimes were very great proficient in the style of *gesture*.

Gesture consists principally in the action of the hands and face; and may be defined, a suitable conformity of the motion of the countenance, and of several parts of the body, in speaking of the subject matter of the discourse. (See AETION.) With regard to oratory, *gesture* may properly be called the second part of pronunciation; in which, as the voice should be suited to the impressions it receives from the mind, so the several motions of the body ought to be accommodated to the various tones and inflections of the voice. When the voice is even and moderate, little *gesture* is required; and nothing is more unnatural and disgusting than violent motion, in discoursing upon ordinary and familiar subjects. The motions of the body should, therefore, rise in proportion to the vehemence and energy of the expression, as the natural and genuine effect of it.

Gesture is either *natural*, or from *imitation*. The former denotes such actions and motions, either of the whole body, or of some particular part of it, as naturally accompany our words, just as these result from the impressions of our minds. As to the whole body, it should not continue long in the same position, but be constantly changing, with a gentle and moderate motion. As to the several parts of the body, the head is the most considerable: to lift it up too high, has the air of arrogance and pride: to stretch it out too far, or throw it back, appears clownish and unmannerly; to hang it downwards on the breast, shews an unmanly bashfulness and want of spirit; and to suffer it to lean on either shoulder, argues sloth and indolence: in calm and sedate discourses, the head should keep its natural state and upright posture, occasionally moving, and turning gently, sometimes on one side, and sometimes on the other, as occasion requires, and then returning back to its natural position. It should always accompany the other actions of the body, except in aversion,



aversion, which is expressed by stretching out the right hand, and turning the head to the left. But nothing is more indecent than violent motions and agitations of the head.

The passions are principally represented by the countenance; and the several parts of the face contribute to the proper and decent gesture of the whole. In a calm and sedate discourse, all the features retain their natural situation. In sorrow, the forehead and eye-brows lower, and the cheeks hang down; but in expressions of joy and cheerfulness, the forehead and eye-brows are expanded, the cheeks contracted, and the corners of the mouth drawn upwards. Anger and resentment contract the forehead, draw the brows together, and thrust out the lips; and terror elevates both the brows and forehead. To these natural signs of the passions, the orator should endeavour to conform.

The motions of the eyes require the most careful management; because, as Cicero observes, (*De Orat. lib. iii. cap. 59.*) other parts of the countenance have but few motions; whereas all the passions of the soul are expressed in the eyes by so many different actions, that cannot possibly be represented by any gestures of the body, if the eyes be kept in a fixed posture. Thus, in speaking on pleasant and delightful subjects, the eyes are brisk and cheerful; but they sink and are languid in delivering any thing melancholy and sorrowful. In anger, the eyes discover a certain vehemence and intenseness; in expressions of hatred and detestation, the eyes are turned either aside or downwards: thus Virgil has expressed Dido's resentment and disdain of Æneas,

“ Illa solo fixos oculos averfa tenebat.”

*Æn. lib. vi. ver. 469.*

The eyes are also sometimes turned downwards, to express modesty; and they should be always turned towards the object which is addressed. A gentle and moderate motion of the eyes is commonly most suitable, whereby they may be directed to some of the audience with an air of respect and modesty; but their motions ought to vary, according to the different nature of the passions which they are designed to discover in the speaker, and convey to his hearers.

The shoulders should neither be elevated nor depressed: a continued motion of the arms should be avoided; their action should be very moderate, and follow that of the hands, which need never be idle: Quintilian lays great stress on the action of the hands, when he says, “The hands, without which all gesture is lame and weak, have a greater variety of motions than can well be expressed: for they are almost equal to our words. Do we not desire with them, promise, call, dismiss, threaten, beseech, detest, fear, enquire, deny? Do not they express joy, sorrow, doubt, confession, penitence, measure, plenty, number, and time? Do not they excite restraint, prove, admire, and shame? That in so great a variety of speech among all nations and countries, this seems to me the common language of mankind.” *Inst. Orat. lib. xi. cap. 3.*

As all bodily motion is either upward or downward, to the right or left, forward or backward, or circular, the hands are employed by the orator in all these, except the last; and as they should correspond with our expressions, they ought to begin and end with them. In admiration, and addresses to heaven, they must be elevated, but never raised above the eyes; and in speaking of things below us, they are directed downwards. Side motion should generally begin from the left, and terminate gently on the right: in demonstrating, addressing, and on several other occasions,

they are moved forward; and in threatening, sometimes thrown back: when the orator speaks of himself, his right-hand should be gently laid on his breast. When no other motion is necessary, the hands should be kept about as high as the breast, so as to make nearly a right angle with the arm. They should never be suffered to hang down, nor to loll upon the cushion or bar. The left-hand should never move alone, but accommodate itself to the motions of the right: in motions to the left, the right-hand should not be carried beyond the left shoulder: in promises, and expressions of compliment, the motion of the hands should be gentle and slow; but in exhortations and applause, more swift. The hands should be generally open; but in expressions of compunction and anger, they may be closed. Neither the breast nor the belly should be thrust out; the trunk should be easy and flexible, suiting itself to the motions of the head and hands; and the feet should be kept steady.

There are other gestures, which arise from imitation, as when the orator describes some action, or personates another speaking: but here he should be careful not to overact his part, by running into any ludicrous or theatrical rhapsody, or changing his action or voice in a manner unsuitable to his own character. See farther on this subject, Ward's *Oratory*, vol. ii. p. 344, &c. p. 360, &c. Shendan's *Lect. on Elocution*, lect. vii. p. 113, &c. See also ACTION, IMITATION, PRONUNCIATION, and VOICE.

GESTUS BONUS, in *Law*. See GOOD *a-bearing*.

GESVALDO, in *Geography*, a town of Naples, in Principato Ultra; 13 miles N.W. of Conza.

GESVES, a river of Africa, which runs into the Atlantic, a little to the north of the island of Bislagos.

GESULA. See GEZULA.

GETA, SEPTIMIUS, in *Biography*, second son of the emperor Severus, and brother and partner of Caracalla, was born at Milan in 189, and was raised to the title of Augustus. In the eighth year of his age he was moved with compassion at the fate of some of the partisans of Niger and Albinus, who had been ordered to be executed, and his father, struck with the humane feelings of his child, remitted the sentences. Though he was not free from the vices of an heir to the empire, yet the mildness of his disposition made him a greater favourite with the people than his brother, and this circumstance inflamed their mutual hatred. On the death of Severus both princes succeeded to a joint sovereignty, but their union was of short duration. Caracalla, jealous of his brother's popularity, ordered him to be poisoned, and when he found the infamous act could not be effected, he murdered him with his own hands in the presence of his mother Julia, who, in the attempt to defend her favourite son, was severely wounded in the arm by Caracalla. Geta had not reached the twenty-third year of his age when he fell a victim to the brutality of his brother. Before his death, Severus had, in the anguish of a disappointed father, retold that the weaker of his sons would fall a sacrifice to the stronger, who, in his turn, would be ruined by his own vices. *Univer. Hist. Gibbon's Rom. Hist.* See also the article CARACALLA.

GETA, in *Geography*, a town of Sweden, on the N. coast of the island of Alan. N. lat. 60° 25'. E. long. 9° 50'.

GETÆ, or GETES, a tribe of Scythians, who, according to Herodotus (l. iv.), inhabited a part of Thrace which is near the Ister or Danube. Strabo says (l. vii.) that they had the same language with the Thracians, and he represents them as occupying those arid and uncultivated plains which lie along the sea-coast between the mouths of the

the Iler and that of the Tyras, in which the army of Darius, in its march against the Scythians, was in danger of perishing for want of water. Pliny (l. iv. c. ii.) says, that they inhabited that diversity of Mount Hamus which is turned towards the Danube. Under the empire of Trajan, the Getæ were subjected to the Roman dominion. Herodotus speaks of Zamolxis as the legislator of the Getæ, and he says that from him they derived the dogma of the soul's immortality; and Trajan attributed to this principle the intrepidity with which they encountered death in the perils of war. The Getæ possessed only a small space along the coast, but their territory extended to a considerable distance in the interior of the country. Those who inhabited the western part in ascending the Danube, were called "Dacians;" but those who were more appropriately denominated Getæ, occupied the eastern parts near the Euxine sea; and those who inhabited the banks of the river Tyras, were called "Tyrgetes." They had all the same language. These people were continually intermixing themselves with the Scythians, Bactaræ, Sarmatians, Mæthians, and Thracians. The Getæ were without doubt the same people with those who were called Goths, and whose migrations were so extensive. See **GOths**.

**GE-TCHAO**, a town of China, of the third rank, in Chang-tong; 27 miles E.S.E. of Lu.

**GÊTE**, part of the country of the Eluts, in Chinese Tartary, so called even to the time of Timur, is regarded by some geographers as the country of the ancient Massagetæ, towards the lakes of Palkati, Balkash or Tengis, and Zaizen. The contaisch, or great Khan, used chiefly to reside at Harcas, or Erga, on the river Ili, which flows from the S.E. into the lake of Balkash. See **JATS**.

**GETHSEMANE**, in *Scripture Geography*, a village in the mount of Olives, whither Jesus sometimes retired, and in a garden of which he endured his agony, and was taken by Judas. Matt. xxvi. 36, &c.

**GETHYLLIS**, in *Botany*, (*γυθυλλίς*, is an ancient Greek name for some sort of pot-herb of the onion-tribe, and is therefore well-enough applied to this bulbous plant, as it appears to be derived from *γαιή*, gaiety or joy, and may allude to the beauty of its blossoms.) Thunb. Nov. Gen. 13. Linn. Gen. 235. Suppl. 27. Schreb. 228. Willd. Sp. Pl. v. 2. 104. Mart. Mill. Dict. v. 2. Juss. 54. (Papiria; Thunb. Act. Lund. p. 1. sect. 2. 111.)—Class and order, *Hexandria Monogynia*. Nat. Ord. *Spathaceæ*, Linn. *Narcissi*, Juss.

Gen. Ch. *Cal.* none, except an obliquely truncated cylindrical sheath. *Cor.* of one petal, superior; tube very long, thread-shaped; limb widely spreading, regular, in six deep, elliptic-oblong, equal segments. *Stam.* Filaments six, inserted into the mouth of the tube, shorter than the limb, often divided; anthers linear, vertical, rolled inwards, often two to each filament. *Pist.* Germen inferior; style simple, capillary, longer than the stamens; stigma capitate. *Peric.* Berry club-shaped, obtuse, radical, sessile on the bulb itself, somewhat fleshy, of one cell. *Seeds* imbedded in pulp, globose, smooth, lying over each other in a triple series.

Ess. Ch. Corolla with a very long thread-shaped tube; limb in six deep segments. Berry radical, club-shaped, of one cell. Seeds numerous.

Obf. Linnæus, misled by the occasional luxuriance of the stamens, placed this genus in the class *Dodecandria*.

Four species are defined in Willdenow, besides his and Jacquin's *G. plicata*, Hort. Schoenbr. v. 1. 42. t. 80, which is *Hypoxis plicata* of Linnæus, and we are at a loss to discover why it is removed to *Gethyllis*, for which no reason is given, nor does the description in Jacquin suggest any,

except the length of the tube. The fruit, when known, must decide the question.

*G. ciliaris*, Linn. Suppl. 198. Jacq. Hort. Schoenbr. v. 1. 31. t. 79. is a good example of the genus. The bulb is globose, with a very strong tuberous base, and thick fibres. *Stem* none. *Leaves* several, three or four inches high, linear, obtuse, fringed, spirally twisted. *Flower* the height of the leaves, greenish-white, the size of a daffodil.

*G. spiralis*, Gwiler in Curt. Mag. t. 1088, has a white flower, externally purplish, and very narrow, flat, smooth leaves. It is distinguished in that work from the original species *G. ajra*, Linn. Sp. Pl. 633. Herb. Linn. on the authority of some specimens and drawings of the late excellent Mr. Masson, in the hands of Messrs. Lee and Kennedy, in which both plants are well defined. According to this authority, *G. ajra* is said to have properly twelve stamens. Thunberg certainly confounded these two.

All the species of *Gethyllis* have the habit of a *Colebiticum*, but the berry, said to be very pleasantly scented and well-tasted, is their striking characteristic. They are natives of the Cape of Good Hope, rarely seen in our gardens, where they do not easily blossom.

**GETONIA**, a name given by Dr. Solander, and, as we presume, derived from *γόνι*, a rustic, but of its application in the present instance we have no information. Roxb. Coromand. v. 1. 61. (Calycopteris; Lamarek Illustr. t. 357.)—Class and order, *Decandria Monogynia*. Nat. Ord. *Holoptaceæ*, Linn. *Elægni*, Juss.

Gen. Ch. *Cal.* Perianth of one leaf, superior, deeply divided into five equal, elliptical, obtuse, spreading segments, permanent. *Cor.* none. *Stam.* Filaments ten, shorter than the calyx, inserted in two rows into the lower part of its segments, capillary, erect; anthers incumbent, roundish. *Pist.* Germen inferior, ovate, furrowed; style thread-shaped, shorter than the stamens; stigma simple. *Peric.* none, except the crust of the seed, which is ovate, furrowed, crowned with the large withered calyx. *Seed* solitary, ovate.

Ess. Ch. Calyx in five deep segments, superior. Corolla none. Seed coated, crowned with the enlarged withered calyx.

1. *G. floribunda*. Roxb. Corom. v. 1. 61. t. 87.—Native of forests on the coast of Coromandel, where it was first noticed by Kœnig, flowering in February and March. The stem is woody and climbing, with long, round, leafy branches, downy like the whole plant. *Leaves* opposite, stalked, ovate, acute, entire, about two inches long. *Flowers* in axillary and terminal, compound leafy clusters, with opposite stalks, inodorous, greenish-white. *Seed* and permanent calyx of a rusty hue.—The natives call this shrub *Bandy-moorroodoodoo*.

We have no doubt of the propriety of Lamarek's synonym, which our lamented predecessor, the Rev. Mr. Wood, not knowing the *Getonia*, could scarcely ascertain. (See **CALYCOPTERIS**.) If we be right, the main branch in Lamarek's plate is diminished, the separate fruits only, and permanent stamens, being of the natural size.

**GETTYSBURGH**, in *Geography*, a small post-town of America, in the state of Pennsylvania and Adams county, situated at the head of Rock creek, one of the headwaters of the Monococy; containing about 30 houses; 9 miles N. of the Maryland line, and 118 W. by S. from Philadelphia.

**GETZENDORFF**, a town of Austria, seated on the river Raisspach; 12 miles S.E. of Vienna.

**GEVASI**, a town of the Arabian Irak, on the Tigris; 95 miles S.E. of Bagdad.

**GEVAUDAN**, a mountainous country of France, so called

called before the revolution, situated in Languedoc; of which Mende was the capital.

GEVES, a town of Africa, situated on a river of the same name, S. of the river St. Domingo.

GEUL, a river of France, which runs into the Meuse, about 5 miles below Maestricht. — Also, a town of France, in the department of the Lower Meuse; 5 miles N. of Wyck.

GEUM, in *Botany*, is mentioned by Pliny, though we learn nothing from that author respecting the derivation of its name. Ambrosinus conjectures that it comes from *geon*, to be splendid, because its beautiful flowers and seeds are the boast and glory of the Alps. — Awns, or Herb-bennet. — Linn. Gen. 256. Schreb. 343. Willd. Sp. Pl. v. 2. 1113. Lamarek. Illustr. t. 443. Mart. Mill. Dict. v. 2. Sm. Fl. Brit. 554. Juss. 358. Gertn. t. 74. (Caryophyllata; Tourn. t. 151. Lamarek. Dict. v. 1. 398.) Class and order, *Leosandria Polygynia*. Nat. Ord. *Scitoseae*, Linn. *Rufaces*, Juss.

Gen. Ch. *Cal.* Perianth of one leaf, in ten segments, rather upright; the alternate segments very small, acute. *Cor.* Petals five, rounded; claws narrow, the length of the calyx, into which they are inserted. *Stam.* Filaments numerous, awl-shaped, of an equal length with the calyx, and inserted into it; anthers short, broadish, obtuse. *Pist.* Germens numerous, collected into a head; styles inserted into the side of each germen, hairy, long; stigmas simple. *Peric.* none; common receptacle of the seeds oblong, hairy, placed on the reflexed calyx. *Seeds* numerous, compressed, rough; each tipped with the long geniculated style.

Eff. Ch. Calyx in ten segments, inferior. Petals five. Seeds with a jointed awn. Receptacle columnar.

Only five species of *Geum* are described by Linnaeus in the last edition of his *Species Plantarum*, though in Willdenow's edition we meet with eleven of this genus, of which number *G. urbanum* and *rivale* are the only British ones, and to which we are enabled, by the assistance of Dr. Smith, to add two non-describers from his herbarium.

1. *G. urbanum*. Common Awns, or Herb-bennet. Linn. Sp. Pl. 716. Engl. Bot. t. 1400. — "Leaves ternate. Stipulas rounded and cut. Flowers erect. Awns of the seeds hooked, naked." — Frequent in woods and hedges, perennial, flowering from May to August. The root is fibrous, and slightly aromatic. Stem erect, about two feet high, branched at the upper part, clothed with deflexed hairs. Leaves unequally ternate, hairy, lobed and cut. Stipulas very large. Flowers terminal, solitary, erect, yellow, with petals shorter than the calyx. Seeds rather hairy, with naked purplish awns.

2. *G. rivale*. Water Awns. Linn. Sp. Pl. 717. Engl. Bot. t. 106. — "Radical leaves lyrate. Stipulas ovate, acute, cut. Flowers drooping. Awns twisted and feathery." — Found in meadows and moist woods more commonly than is usually imagined, perennial, flowering in June and July. Root spreading, woody, astringent and aromatic, sometimes of use in intermittent fevers. Stem about a foot high, drooping at the top. Leaves lyrate, or confusedly pinnate, serrated, hairy. Petals erect, never fully expanding. The general appearance of this elegant species, an universal favourite amongst botanists, is thus justly described in English Botany, "the rich combination of the dark-green wrinkled leaves, with the glowing red-brown of the stem and calyx, and singularly delicate colour of the petals, added to the graceful position of the flowers, render this one of the most picturesque of our native plants."

3. *G. virginianum*. American Awns. Linn. Sp. Pl. 716. (*G. canadense*; Jacq. Hort. v. 2. Sz. t. 175.) — "Stems

leaves ternate; the upper ones lanceolate. Stipulas oblong. Flowers erect. Awns of the seeds naked, hooked. — Native of North America, from whence it was introduced by Mr. P. Miller in 1739. It is nearly allied in habit to *G. urbanum*, but the petals, which are shorter than the calyx, are white, and the whole plant is of a greener hue. Its leaflets are also more acute toward the base. It flowers in June, and is a hardy perennial. Root inodorous. Radical-leaves generally bipinnate. Seeds smooth.

4. *G. strictum*. Upright Awns. Willd. Sp. Pl. v. 2. 1113. (*G. alpepticum*; Jacq. Ic. Rer. v. 1. 10. t. 93.) — "Stem-leaves pinnate; leaflets and stipulas eleven and cut. Flowers erect. Petals longer than the calyx. Awns of the seeds naked, hooked." — Native of North America. A hardy perennial, flowering in June and July. Flowers yellow. Fruit hairy. The whole plant is covered with whitish hairs.

5. *G. japonicum*. Japan Awns. Willd. Sp. Pl. v. 2. 1114. Thunb. Japon. 220. — "Leaves simple, mostly three-lobed, shaggy. Flowers erect. Fruit hairy. Awns naked." — There is no figure of this species, which is perennial, and grows in Japan. Stem round, rather more than a foot high. Flowers terminal, with petals as long as the calyx. Seeds ovate, covered with greyish hairs.

6. *G. pyrenaicum*. Pyrenean Awns. Willd. Sp. Pl. v. 2. 1115. (Caryophyllata pyrenaica, amplifloro et rotundicori folio, mutata flore; Tourn. Inst. 295.) — "Flowers drooping. Petals longer than the calyx. Awns hairy, twisted at the base." — This is taken up by Willdenow from Tournefort, and is perennial, found on the Pyrenées. Its appearance is similar to *G. rivale*, but differs in the large size of its radical leaves, and shape of its awns, which are thinly covered with hairs, and naked at the top. Stem erect, about a foot and half high. Seeds very woolly.

7. *G. atlanticum*. Awns of Mount Atlas. Willd. Sp. Pl. v. 2. 1116. Desfont. Atlant. v. 1. 402. — "Lower-leaves pinnate. Stem generally single-flowered. Fruit hairy. Awns twisted." — A native of Mount Atlas, perennial. Stem nearly two feet high, simple. Stipulas large, ovate, cut. Flowers yellow. This is nearly allied to *G. montanum*, but differs in having fewer leaflets, a taller stem, and twisted, not bearded, awns.

8. *G. potentilloides*. Siberian Awns. Willd. Sp. Pl. v. 2. 1116. (Dryas geoides; Jacq. Hort. v. 3. 38. t. 68.) — "Leaves pinnate, toothed. Stem with about two flowers. Calyx of the fruit erect. Awns straight, naked." — Native of the mountains of Siberia, and introduced into Kew gardens in 1780 by Dr. Pallas. We have it from Chelsea garden. It flowers in June, and is a hardy perennial. Root inodorous, but with an aromatic taste. Petals yellow, larger than the divisions of the calyx. Seeds with long awns.

9. *G. montanum*. Great Mountain Awns. Linn. Sp. Pl. 717. Jacq. Austr. v. 4. t. 373. — "Leaves pinnate. Hairy; the outer leaflet very large, round; the lower ones regularly decreasing. Stem single-flowered. Awns upright, shaggy." — This, and the following species (*G. reptans*) are found most abundantly on the high Alps of Austria and Switzerland, where they are extremely ornamented during the months of July and August. Mount Cenis is described by travellers as a favourite habitat of these beautiful plants. The root of *G. montanum* is fibrous, astringent, and somewhat aromatic. Stem round, leafy, from three or four inches to a foot in height, erect, generally single-flowered, simple. Petals roundish, yellow, longer than the calyx. Seeds oval, brown, with a long feathery awn.

10. *G. reptans*. Creeping Awns. Linn. Sp. Pl. 717. Jacq. Austr. v. 5. 38. t. app. 22. — "Leaves pinnate, cut,

hairy. Runners of the stem creeping. Stem single-flowered. Awns upright, shaggy.—Place of growth and time of flowering same as in the preceding species. Root yellowish. Runners long, reddish. Flower-stalks erect, reddish, shaggy. Petals five or eight, sometimes ten, large, yellow. Seeds retaining the style, which is broken off in the middle and looks like a jointed awn.

11. *G. anemonoides*. Anemone Awns. Willd. Sp. Pl. v. 2. 1117.—“Leaves pinnate, smooth; leaflets wedge-shaped, toothed at the top. Stem single-flowered. Awns upright, shaggy.”—There is no figure of this rare species extant. Willdenow has very properly reduced it to *Geum*, though the plant was formerly known as *Dryas pentapetala*. (Linn. Sp. Pl. 717.) Native of Kamtschatka. Root perennial, throwing out filiform, woody creepers. Stipulas narrow. Petals five, large, round, white, spreading. Seeds numerous, tipped with an hairy awn, and longer than the flower. It appears by the Linnaean Herbarium to be a very elegant species.

12. *G. parviflorum*. Small White Awns.—Radical leaves lyrate, taller than the stem. Stipulas cut. Flowers nearly sessile. Petals shorter than the calyx. Awns feathery.—Gathered by Commerçon in the Straits of Magellan. The radical leaves are interruptedly lyrate, hairy, bluntly cut and crenate, about three inches long, most resembling those of *G. rivale*. Stem solitary, scarcely two inches high, clothed with short dense hairs, and bearing two or three ternate wedge-shaped leaves, and as many small, nearly sessile flowers, which appear to be somewhat drooping, but this can scarcely be determined by the dried specimen. The petals, said by Commerçon to be white when fresh, are smaller than the segments of the calyx. Germens hairy as in *G. rivale*.

13. *G. calthifolium*. Marsh-marigold leaved Awns.—Radical leaves kidney-shaped, almost circular, sharply crenate; on slightly leafy stalks. Calyx turbinate, with lanceolate segments. Awns hairy.—Gathered by Mr. Menzies on the west coast of North America.—This is remarkable for the resemblance of its radical leaves in shape and size to those of *Caltha palustris*, except their being slightly hairy, and their long footstalks being furnished with a few little oblong or three-lobed leaflets, indicating an approach to a lyrate leaf altogether. Stem above a foot high, erect, bearing three or four smaller, sessile rounded leaves, more deeply crenate or cut, and terminating in about three flowers, on slender stalks. Calyx hairy at its base, turbinate; its segments oblong-lanceolate, obtuse, at length erect, the larger ones equal in length to the petals which are yellow and broad, like those of a common Crowfoot. Awns straight, bluntish, hairy in the lower part, possibly becoming hooked at an advanced period.

*GEUM Urbanum*, in the *Materia Medica*, is a common British plant, called *Awns*, in woods and hedges, flowering from May till August. The root, which is the part medicinally employed, has an aromatic and somewhat astringent taste, and a pleasant smell of the clove kind, especially when it is produced in dry and warm soils. It gives out its astringent matter equally to watery and spirituous menstria; but its aromatic part most perfectly to the latter. In distillation with water it yields a small quantity of whitish concrete oily matter, of a very grateful fragrance. This plant, though little used in Britain, is held in great estimation for various virtues on the continent; but the character, under which it has been received since the year 1780, is that of a febrifuge; many instances having been adduced of its efficacy in obstinate intermittents, after the Peruvian bark had failed. It is said that a tincture of the root, made in the

proportion of four ounces of the root digested with a quart of brandy in a sand heat, and given in the quantity of half an ounce or more, two, three, or four times a day, seldom fails to cure agues. Others have given it with equal success in decoction, powder, or electuary, in the proportion in which the Cinchona bark is commonly employed. This root has also been found useful in several chronic disorders, as a general tonic and astringent; and experiments made by Buchhave evince its antiseptic power to exceed that of Peruvian bark. Woodville, Med. Bot.

GEVOLLUNG, in *Geography*, a town of Austria; eight miles S. of St. Pölten.

GEVREY, a town of France, in the department of the Côte d'Or, and chief place of a canton, in the district of Dijon; 7 miles S. of Dijon. The place contains 1128, and the canton 7894 inhabitants, on a territory of 260 kilometres, in 36 communes.

GEUINA, in *Botany*, a barbarous Chili name, adopted by Molina.—Juss. 424.—Class and order, *Didymia An-giosperma*. Nat. Ord. uncertain.

Gen. Ch. Cal. none. Cor. Petals four, placed crosswise. Stam. Filaments four, two of them very short. Pist. Germen superior, simple; style one; stigma thickish. Peric. Capsule nut-shaped, coriaceous, of one cell. Seed solitary. A tree, native of Chili, where Dombey and Molina have gathered it. The leaves are pinnated, composed of four or five pair with an odd one. Flowers terminal, spiked, two together, many of them abortive. Fruit eatable, like a hazel-nut, whence the Spaniards call it *Avellano*. Seed destitute of albumen. Capsule much like that of the *Calophyllum*. Juss.

GEUSS, JOHN MICHAEL, in *Biography*, was born in Holstein in 1745. His father undertook the care of his education, and found in his son a turn for mathematical and philosophical pursuits, which he encouraged, and by which he became distinguished, and was chosen professor of the mathematics in the university of Copenhagen. His principal work was the “Theory of the Art of constructing Mines,” in the composition of which he was assisted by the MSS. of Belidor, which he had the good fortune to obtain, though they had been suppressed in France, after the death of that able engineer. He published also a “Treatise on the Art of constructing Mines.” He gave a translation in the German language, from the Danish, of Olafsen and Povelsen's voyage to Iceland, which was printed in two volumes 4to. He sent several valuable papers to Brehm's, Ingenieur-und-Artillerie Magazin, and published a set of logarithmic tables.

GEUTZ, in *Geography*, a town of Germany, in the duchy of Anhalt-Cothen, near Cöthen.

GEWICZE, GEWICZ, or *Geuifsch*, a town of Moravia, in the circle of Ohnutz; 24 miles west of Olmutz. N. lat. 49 45. E. long. 16 35.

GEWOLD, CHRISTOPHER, in *Biography*, flourished in the seventeenth century. He was one of the aulic counsellors of Maximilian, first elector of Bavaria, who confided to his care the archives of the duchy, in order that he might make use of them as an historian. His works relate chiefly to the history of his own country; of these we may mention “Genealogia Serenissimorum Bojarum Ducum, 1605.” “Chronicon Monasterii Reicherfpergensis.” “Delimitatio Norici veteris, ejusque Continuum;” and “Commentarius de Septem viratu Romani Imperii.” Moreri.

GEX, in *Geography*, a small territory of France, in the cidevant province of Burgundy, extending from Fort d'Ecluse to the village of Croffay, and from the town of Gex to Geneva, being seven leagues in length and three in breadth.

breadth, watered by the Rhine and other streams, and bounded on the west by mount Jura, which yields excellent pastures. The principal articles of trade are cheese, wine, and coal. It now forms a part of the department of lake Lemman.

**GEX**, a town of France, in the department of Lemman, and chief place of a canton, in the district of Geneva, situated at the foot of mount St. Claude; 9 miles N. N. W. of Geneva. The place contains 2461, and the canton 9209 inhabitants, on a territory of  $212\frac{1}{2}$  kilometres, in 14 communes. N. lat.  $46^{\circ} 20'$ . E. long.  $6^{\circ} 8'$ .

**GEYER**, a town of Germany, in the circle of Erzgebürg, situated in the midst of mines, and having manufactures of vitriol, sulphur, alum, and arsenic; 6 miles W. S. W. of Wolkenstein.

**GEYERSBERG**, a town of Bohemia, in the circle of Koniggratz; 28 miles E. N. E. of Chrudim.

**GEYRACH**, a town of the duchy of Stiria; 9 miles S. S. E. of Cilley.

**GEYSS**, or **GEYSA**, a town of Germany, in the bishopric of Fulda, situated on the Ulster; 15 miles N. E. of Fulda. N. lat.  $50^{\circ} 43'$ . E. long.  $10^{\circ}$ .

**GEYSS Rücken Jaffeck**, a mountain of Germany, which separates Upper Carniola from the county of Cilley; 6 miles N. E. of Stein.

**GEYSZING, NEW**, a town of Saxony, in the margraviate of Meissen; 12 miles S. E. of Pilitz.

**GEZAEL**, a town of the Arabian Irak, on the Euphrates; 120 miles W. N. W. of Bassora.

**GEZAN**, or **DSJESAN**, a sea-port town of Arabia Felix, in the principality of Abu-Arifch (see *Abu-Arifch*); 23 miles W. of Abu-Arifch, the capital of the principality. This province of Gezan, situated on the Arabic gulf, and in a fertile country, carries on a considerable trade in fenna, of which great plenty is furnished by the circumjacent territory, and also in coffee, which is brought hither from the mountains of Hafchid-u-Bakil. It has a trade likewise with the ports on the opposite side of the Arabic gulf; but has no intercourse with the subjects of the Imam.

**GEZEID**, a town of Egypt, on the right bank of the Nile; 27 miles N. N. W. of Cairo.

**GEZIRA**, or **JASSEERA**, a town of Asiatic Turkey, and capital of a pachalic, in the province of Diarbekir, on the right bank of the Tigris. The whole province of Diarbekir is also called "Al Gezira;" 75 miles S. E. of Diarbekir. N. lat.  $37^{\circ} 16'$ . E. long.  $40^{\circ} 42'$ .

**GEZIRA CUBROS**, in the *Materia Medica of the Ancients*, a name given to tale by Avicenna, Serapion, and others. These authors do not give any explication of what sort of substance they mean by this name, but seem to suppose it a thing universally known, and only give a list of its qualities.

**GEZIRAT AL DAHAB**, or *Gezirat Iddabah*, or the *Golden Island*, in *Geography*, an island in Lower Egypt, formed by canals cut from the left bank of the Nile, opposite to Faoua.

**GEZIRAT AL TEIR**, or *Island of Birds*, an island in the Red sea. N. lat.  $22^{\circ} 18'$ . E. long.  $37^{\circ} 56'$ .

**GEZULA**, or **GESULA**, an inland province of the empire of Morocco, E. of the province of Suz, and N. of Vled de Nan; this, together with the province of Dra, lies in the vicinity of mount Atlas which, in this southern part of the country, extends almost to the sea. The inhabitants of this province are considered as the most ancient people of Africa. The country produces a great quantity of barley, and affords pasture for cattle: it has mines of iron and copper, of which are made various utensils, that are exchanged for cloth, spices,

horses, and other necessaries. It has every year a fair, which lasts two months, for the sale and exchange of cattle and merchandize in general. The people are free, being allies rather than subjects of Morocco. Their arms consist of fibres, large sharp two-edged swords and lances. They are numerous, but have no towns, and they generally live in camps and villages.

**GFOLL**, a town of Austria; 8 miles W. N. W. of Crems.

**GHALESKA**, a town of Arabia Felix, which was once a famous city and sea-port, but now sunk into decay, about 20 cottages only remaining to shew the place where it stood, and the inhabitants are provided only with dates, and the milk and flesh of a few sheep; 20 miles S. of Hodeida.

**GHALGHULUWA**, in *Zoology*, the Ceylonese name of a species of East Indian serpent, a snake of a pale brown, variegated with transverse streaks of white, and found among rocks and bones.

**GHAN** is a name given in Muscovy to caravanferas.

**GHANA**, as Edrifi and Abulfeda call it, or **GHINNY**, in *Geography*, a city and capital of a kingdom in Africa, situated nearly midway between the Indian sea and the Atlantic on the E. and W.; and between the Mediterranean and the Ethiopic seas on the N. and S.; and, therefore, considered by major Rennell as the point on which the *central* and *eastern* positions depend. This country lies on the borders of the Neel-Abced, or Guin river, and is bounded on the N. by Cathua or Kassina, on the E. by Wangara, on the S. by Melli or Lamlem, and on the W. by Mekzara and Kassina. The city is placed in Rennell's map on the north bank of the river. According to Edrifi, Ghana is distant 37 journies (each day's journey of Edrifi being about 19.06 geographical miles) from "Germa," through Agadez, or Agadofi. Germa is an ancient and ruined city of Fezzan, about four journies E. S. E. of Mourzouk, in N. lat.  $27^{\circ} 25'$ . E. long.  $16^{\circ} 20'$ . Agadez is 25 of Edrifi's journies from Germa, bearing S. by W. or S. S. W. from the capital of Fezzan. Ghana is 12 days of Edrifi's scale to the southward of Agadez, or about 229 geographical miles. It appears that Ghana lies somewhat to the east of the line which passes through Agadez from Germa, and Mr. Rennell has taken 700 as the general line of distance from Germa to Ghana. Mr. Matra was told, at Morocco, that Ghinny (Ghana of Edrifi) was 40 journies from Kabra, the port of Tombuctoo, along the bank of the Niger. These, taken at the caravan rate between Fezzan and Egypt, Morocco and Jarra, &c. that is, at 16.3 per day, produce 652 geographical miles. The intersection of this line with that from Germa places Ghinny in N. lat.  $16^{\circ} 10'$ . E. long.  $13^{\circ} 2'$ ; in which position it stands at 760 miles from the city of Benia, on the coast of Guinea. For the further settlement of this important point in adjusting the map of Africa, see Rennell's Proceedings of the African Association, p. 119, &c.

**GHANARA**, a city of Africa, the capital of Wangara, situated on a river, which runs into the Niger, or rather into a lake (the Lybia Palus of Ptolemy) formed by the Niger. N. lat.  $13^{\circ} 40'$ . E. long.  $15^{\circ} 40'$ .

**GHAUSA**, or **GASSA**, capital of a district in the northern part of Bootan, in the East Indies, and the station of a zampoon, or provincial governor. The highest mountain in its neighbourhood, whose head is eternally covered with snow, sends forth a spring of water at its base of so great a degree of heat, that few are found capable of bearing, even for a short time, any part of the body immersed in it. It is situated near the spring-head of Pa-tchen river. N. lat.  $27^{\circ} 53'$ . E. long.  $89^{\circ} 13'$ .

GIAT, a small island in the river St. Lawrence. N. lat. 35° 30'. W. long. 93° 20'.

GIAYKANI, a town of Persia, in the province of Irak; 25 miles E. of Huzan.

GIEBAN. See GEBAN.

GIEBRABA, a town of Persia, in the province of Irak; 5 miles N.W. of Huzan.

GIEDI, a town of Italy, in the department of the Mela; 10 miles S. of Brindisi.

GIEDEMIS. See GADAMIS.

GIEDEN, a town of Asiatic Turkey, in the government of Sivas; 15 miles S. of Amasieh.

GIEDMAN, a town of Persia, in Chorasan; 18 miles S. of Herat.

GIEIRA, a town of Asiatic Turkey, in Natolia; 38 miles N.N.E. of Moglia.

GIEIVE, a town of Asiatic Turkey, in Natolia; 20 miles E.N.E. of Huk.

GIELA, a town of Arabia, on the coast of the Red sea, anciently called "Oculus;" 48 miles S.S.E. of Mocha.

GHELEN, SIGISMUND, in *Biography*, was born of a respectable family at Prague. When he had attained to a proper age for improvement by foreign travel, he went into France and Italy, and acquired an accurate knowledge of the languages of those countries. On his return he passed through Basil, and made himself known to Erasmus, at whose recommendation Froben engaged him as his corrector of the press, by which he gained a small but competent maintenance. He soon assumed a higher office than that of corrector of proof-sheets, and joined to it the duties of a critic and translator. He published a dictionary of the Greek, Latin, German and Dalmatian languages; and annotations upon Pliny and Livy. He translated from the Greek into Latin the Antiquities of Josephus, some Homilies of Chrysostom, and many other learned works. Just before his death, which happened in 1554, he had employed his talents on, and nearly finished, a version of Justin Martyr's works. Besides those already mentioned he was editor of many other works. He was acute and ingenious, and wrote with elegance and fluency. In his private character he was mild and placid, simple and sincere. Moreri.

GHEMARA. See GEMARA.

GHEME, in *Geography*, a town of Italy, in the department of the Gogna; 13 miles N.N.W. of Novara.

GHEMISH, a town of Asiatic Turkey, in the government of Sivas; 24 miles W. of Amasieh.

GHENNA. See GAINNA.

GHENT, a city of France, and chief place of a district, in the department of the Scheldt, formerly capital of Aulrian Flanders, situated on the conflux of the rivers Scheldt, Lis, Moeze, and Lieve, which, together with a number of canals, intersect it in a variety of directions, and divide the town into 26 small islands. It is encompassed by walls about 15 miles in circumference, and includes gardens and corn-fields. Since the French revolution it has been divided into four quarters, *viz.* North, South, East, and West, and as many cantons. The former contains 15,000, and the corresponding canton 17,454 inhabitants, on a territory of 22½ kilometres, in two communes; the second, or south, contains 15,000, and its canton 16,469 inhabitants, on a territory of 35 kilometres, in two communes; the third, or east, includes 13,000, and its canton 16,073 inhabitants, on a territory of 35 kilometres, in three communes; and the fourth, or west, contains 13,000, and its canton 18,319 inhabitants, on a territory of fifteen kilometres, in three communes. This city was first chosen for their habitation

by the Nervii, and afterwards occupied by the Vandals, who gave it the name of "Wanda," whence the present appellation of Gand, or Ghent, is supposed to be derived. It was encompassed with walls by Odoacer, grand forester of Flanders, and has since been frequently enlarged, particularly in the year 1397, by order of Philip the Bold, 25th count of Flanders. The inhabitants were always warlike, and often engaged in military contests with their own princes, and with their neighbours, which were conducted in many instances with savage cruelty, and terminated in extensive and sanguinary slaughter. Ghent was the birth-place of Charles V., of whose nativity in their town the inhabitants had little reason to boast, as he loaded them with frequent and heavy impositions, chastised them with rigour for their occasional revolts, and subjected the magistrates and several of the chief citizens to the most humiliating treatment. This conduct on his part inflamed their disposition to revolt, and the consequence was, that one of the finest cities in Europe was reduced to a state of perfect solitude. However, it afterwards regained some small portion of its ancient splendour, and became, at least previously to times of recent confusion, considerable. In November 1676, was concluded in this city the famous treaty called the "Treaty of Ghent," consisting of 25 articles, and amongst others some of them stipulating that the Spanish and foreign troops should leave the country, that the provinces of Holland and Zealand should remain united with the others, that the Catholic religion should be maintained, and that the ancient privileges of the country should be secure; and this treaty was approved and ratified by Philip IV., king of Spain. In 1678 Ghent was taken by Louis XIV., king of France, but restored to Spain at the treaty of Nimegue in the same year; and it remained in their possession till it was taken by the allies in 1706, after the battle of Ramillies. It was seized by the French in 1708, but recaptured by the allies under prince Eugene and the duke of Marlborough, in the same year. Ghent was erected into a bishopric in 1559 by pope Paul IV., at the solicitation of Philip II., king of Spain, subject to the archbishop of Malines. It had, besides the cathedral, six parish churches, and many religious houses: some of the streets are broad and well-paved, and the market places spacious, in the middle of one of which is a statue of Charles V., in his imperial habit. Ghent carries on a considerable trade in cloth, linen, lace, and silk manufactures, and is much assisted, in favourable times, by two navigable canals; one to Sas-de-Ghent, and another to Bruges, Olland, &c. The magistracy consists of burgomasters, echevins, and common-council. John, the third son of Edward III., king of England, was born in this city, and from this circumstance called John of Gaunt. In November 1792, the French took possession of this city, but evacuated it on the retreat of Dumourier; however, they afterwards regained it in their progress through the country: 30 miles S.W. of Antwerp. N. lat. 51° 3' 15". E. long. 3° 43' 20".

GHER, a town of Africa, in the county of Sugulmeffa, or Sijilmassa, on the Ziz, near mount Atlas; 90 miles N.W. of Sugulmeffa.

GHERANGOL, a town of Africa, in the country of the Foulahs, on the S. side of the river Senegal. N. lat. 16° 40'. W. long. 14°.

GHEREDE, a town of Asiatic Turkey, in Natolia; 28 miles E. of Boli.

GHERGISTEN MOUNTAINS, a chain of mountains of Asia, situated on the N. of the country of Candahar, 15 miles N. of Candahar.

GHERGONG, or KIRKANU, a town of Afam, and capital of the country, on the Degoo, 160 geographical miles



miles nearly E. by N. from Goalpurah. The houses are constructed of wood, and each of them has a garden, or some cultivated ground in front, which gives the place a great extent. It is fortified, and has four gates, encompassed with a fence of bamboos, and inclosing villages and tilled fields; it is constructed of stone and earth. The rajah's palace is surrounded by causeways, planted with bamboos, and the ditch on the outside is full of water; the palace contains many lofty and spacious apartments, particularly a saloon 150 cubits long and forty broad, supported by 66 pillars of wood at certain intervals. In the town there is a small market, which, however, contains no shop-keepers, but the sellers of betel; as the inhabitants lay up a stock of provisions sufficient to last them a year, and have no occasion to purchase any for daily use. N. lat. 35° 30'. E. long. 93° 10'. See ASAM.

GHERIAH, a sea-port of Hindoostan, on the west of Pirate coast, in the county of Concan; late the capital and principal port of Angria. It was strongly fortified by the pirate Angria, from whom it was taken by admiral Watson and colonel Clive, in the year 1756; 80 miles N.N.W. of Goa. N. lat. 16° 37'. E. long. 73° 8'.

GHERKINS. See GUERKINS.

GHERMA, or GERMA, in *Geography*. See GHANNA.

GHERMANSIK, a town of Asiatic Turkey, in Natolia; 15 miles E. of Scala-Nova.

GHERRI. See GERRI.

GHERUA, a town of Arabia, in the province of Lachsa, or Hadsjar; 45 miles W.N.W. of El Calif.

GHERZE, a town of Africa, in Tripoli; 50 miles S. of Mesurada. N. lat. 31° 28'. E. long. 14° 30'.

GHSILPOUR, a town of Hindoostan, in the circuit of Rantampour; 28 miles S.S.W. of Suifopour.

GHEUK SHA, *i. e.* *Blue Water*, a lake of Persian Armenia, 60 miles long, and 6 broad; 50 miles E.N.E. of Erivan.

GHEUREL, a town of Asiatic Turkey, in Natolia; 28 miles W.N.W. of Angara.

GHEUTSI, a town of Asiatic Turkey, in Caramania; 16 miles E. of Cogni.

GHEYSSIQUAS, a tribe of Hottentots, inhabiting a district of South Africa, bordering on the country of Caffraria. M. Vaillant, being at no great distance from Orange river, found some of these people, who pointed out to him a chain of mountains to the east, which was occupied by their principal tribes, and which separated them from the Caffres, or at least from the Briquas and Bremas, considered by them as tribes of Caffres. The chief difference between the Gheyssequas and the nations that surround them consists in the colour of their ornaments, to which they impart a dazzling whiteness by processes peculiar to themselves. The women are well-made, lively, and prone to laugh or dance; but at the same time modest and reserved. The people, in general, are said to be very hospitable and generous. The practice of semi-castration prevails in all their hordes without exception, and they are the only tribe among the Hottentots who adopt it. Different accounts are given by travellers of the reason of this singular operation. Kolben, stating it to consist in the extraction of the left testicle, represents it as a religious ceremony, prevailing among all the Hottentots, but this is not true in fact. Others ascribe it to a desire on the part of the Gheyssequas to remove every impediment in running, and others again assign as its cause a wish to prevent the too abundant propagation of the species.

But neither of these causes produced the effect ascribed to them. Vaillant supposes that it is a mark of distinction, adopted by their ancestors, when at war with neighbouring nations, by which they might know one another; but this account is no less fanciful and improbable than any other. Whatever is the cause from which this practice originates, it is performed by the father, commonly at the birth of the child; though it is sometimes deferred till the child has completed his third year.

GHEZ, a town of Grand Bucharia; 24 miles S.S.E. of Balk. N. lat. 36° 16'. E. long. 65° 40'.

GHEZAN. See GEZAN.

GHEZZI PIER LEONE, called *Cavalier Ghezzi*, in *Biography*, a painter who was a pupil and imitator of Pietro Cortona. He was selected with Luti Trevisani, and other artists of the same style, to paint the prophets in St. John Lateran; and executed many other works of less consequence; but he obtained most celebrity by his skill in caricature, which he freely indulged.

GHIABUNDER, in *Geography*, a town of Bengal; 25 miles S.S.W. of Goragot.

GHIBELINS. See GIBELINS.

GHICKERS, an appellation given to those who inhabited the northern and largest division of the hilly tract situated between the Behut, the Sinde, and Casimere, in Hindoostan, by way of contrast to the Joudis, who occupied the southern and least division.

GHIDORE, in *Geography*, a province of Bengal, bounded on the N. by Bahar, on the N.E. and E. by Curruckpour, on the S. by Birboom, and on the S.W. by Curruckdeah and Moy. The chief place is Ghidore; which is 70 miles S.E. of Patna. N. lat. 24° 53'. E. long. 86° 23'.

GHEZ, a fortress of Persia, in the province of Irak, taken by the Afghans in 1723.

GHILAN, or KILAN, synonymous with the ancient *Gela*, a province of Western Persia, bounded on the N. by the provinces of Aderbajan or Aiderbeitzan and Schirvan, on the N.E. by the Caspian sea, on the E. by the Caspian sea and the province of Mazanderan, on the S. by the Persian Irak, and on the W. by the provinces of Aderbajan and Curdistan; about 200 miles from E. to W., and 150 from N. to S. This is one of the most beautiful and fertile provinces of Persia, producing silk, olives, rice, tobacco, and most excellent fruits of all kinds, and in such abundance, as not only to supply the wants of its inhabitants, but sufficient to provide for a great part of Persia and Armenia. The manufactures and silks of Ghilan are esteemed the best in Persia, and have been in such repute for many years, that Rasid, its capital, is become one of the first commercial towns in this part of Asia. The finest sort is usually white, and chiefly sent into the interior cities of Persia, or sold to the Turks; the inferior kind is yellow, and principally disposed of to the Russians. Rasid supplies the bordering provinces of Persia, and the independent neighbouring states, as far as Georgia, with European merchandize, except the goods which are transported immediately from Astrakan, through Killar and Mostok, to the nearest part of Georgia, and of the neighbouring mountains; and those sent from Shamakee to the Lefgue Tartars, and other independent tribes. In this province are seen whole forests of mulberry, box, and walnut trees. Every peasant has a garden to his cottage, planted with orange-trees, citrons, figs, and vines. For a farther account of the trade and government of this province, we refer to the articles CASPIAN SEA and PERSIA. We shall here only add, that in the year 1792 Akau, called by Dr. Pallas Aga Mamet, collected an army, and pursued his conquests in the vicinity of Ghilan, till at length he had

no rival, except Hidaet, khan of Ghilan, whom he forced to fly from Rasht or Rasht, his place of residence, and who was killed near the port of Samilli. In consequence of these events Akou became monarch of the whole of Western Persia; and having been made an eunuch in his infancy by order of Nadir Shah, he nominated for his successor his nephew Baba Serdar.

GHILDI, a town of Africa, on the Senegal; 30 miles N.W. of Gallam.

GHILON, a town of Kurdistan; 50 miles S.S.W. of Erbil.

GHINALA, a town and territory of Africa, on the river Rio Grande, near its mouth. N. lat. 11° 15'. W. long. 14° 15'.

GHINIA, in *Botany*, so named by Schreber in memory of Luca Ghini, who, in the 16th century, was professor of botany at Bologna and Pisa, in each of which universities he greatly improved, if he did not entirely found, the botanic garden, and was the first who made the study of botany an essential part of medical education. He published no book himself, but Haller mentions the existence of a manuscript copy of his lectures, and he communicated many things in correspondence to the writers of his time. Schreb. 19. Willd. Sp. Pl. v. 1. 114. Mart. Mill. Dict. v. 2. Swartz. Ind. Occ. v. 2. 1087. (Tamonea; Aubl. Guian. 659. Juss. 109. Lamarek, Illustr. t. 542. Swartz. Prod. 94.)—Class and order, *Didymia Angiosperma*. Nat. Ord. *Personata*, Linn. *Tilices*, Juss.

Gen. Ch. *Cal.* Perianth of one leaf, tubular, permanent, inferior, its orifice with five pointed spreading teeth. *Cor.* of one petal, irregular; tube long, narrow; limb of two lips, the upper one largest, roundish, concave, ascending; lower in three deep roundish segments, the middlemost larger, deflexed, emarginate. *Stam.* Filaments four, inserted into the tube above its base, two of them longer than the rest; anthers each of two separated oblong cells, one of them terminal, fertile in the longer filament only, the other like a little scale in the middle of each filament. *Pist.* Germen roundish, superior; style thread-shaped, the length of the tube; stigma four-lobed. *Peric.* Drupa turbinate, angular, dry, projecting beyond the permanent calyx. *Nut* angular, of four or five cells. *Seeds* solitary.

Ess. Ch. Calyx with five sharp spreading teeth. Corolla ringent, two-lipped; the lower lip three-lobed. Nut coated, four-celled, invested with the calyx. Seeds solitary. Anthers of two distant lobes.

Obs. We think this genus ought to be placed in *Didymia*, along with *Verbena*, to which it is nearly akin, though only the longer filaments appear to be perfect; but this may be variable, and cannot well be determined without repeated examinations of wild specimens.

1. *G. spinosa*. Willd. n. 1. Ait. Hort. Kew. ed. 2. v. 1. 45. (*G. verbenacea*; Sw. Ind. Occ. v. 2. 1089. *Verbena curassavica*; Linn. Sp. Pl. 28. *Veronica* similis, &c. Herm. Parad. t. 240.)—"Fruit with four thorns. Leaves smooth."—Native of several parts of the West Indies, where Houston and Swartz have gathered and examined it. This is an annual and rather humble herbaceous plant, with a branched stem, ovate deeply serrated leaves, and long loose spikes of small whitish flowers.

2. *G. mutica*. Willd. n. 2. Sw. Ind. Occ. v. 2. 1090. (Tamonea *picata*; Aubl. Guian. 660. t. 268.)—"Fruit without thorns. Leaves downy."—Native of Guiana and Cayenne. Much like the former, but with downy leaves, and an unarmed fruit, and the middle segment of the lower lip of the corolla, according to Swartz, is emarginate in this, entire in the preceding. Neither of them have much

beauty, nor any other qualities to recommend them for cultivation with us in the stove, though perhaps they might be planted out for the summer, if desirable, like other tender annuals.

GHINNA, or GIENNE', in *Geography*, a town of Egypt, on the E. side of the Nile, opposite to Kust, or Coptos, on the other side, and distant from Cosseir, or Kofire, on the Red sea, about 90 geographical miles. N. lat. 26° 11'. E. long. 32° 45'.

GHINUE, a town of Asiatic Turkey, in Natolia; 24 miles N.W. of Sinob.

GHIO. See KENLIK.

GH O, a town of Africa, belonging to the Foulahs, on the Senegal; 12 miles S.W. of Goumel.

GHIR. See GIR.

GHIRGIN. See GUNGUIN.

GHIRLANDAIO, DOMENICO, in *Biography*, a painter, of whom Vafari speaks as being of the first rank in his time. His real name was Corradi. He at first was employed by his father, in his own profession of goldsmith, at Florence, who obtained the name of Ghirlandaio, by having been the first to make little metallic garlands (*Ghirlandi*) for children to wear. Domenico continued to paint, after he had adopted painting as his profession, for the churches and convents in Florence, both in fresco and in oil. He, like other artists of the time, introduced into his pictures the portraits of his friends, but gave them more character appertaining to the subject, than had hitherto been done there; and he was the first who left off gilding in pictures, and attempted to imitate its effects by colours. He was called to Rome by Sixtus IV. to assist other masters employed in painting his chapel. His works there were afterwards spoiled to make room for those of M. Angelo. He was highly honoured, and employed nobly; but his greatest glory is, having had the great hero of the art, M. Angelo, for a pupil. He died in 1493, at the age of 44. His brothers, David and Benedetto, finished many of his works, and educated his son Ridolfo to the art, who afterwards made great progress, and obtained esteem from Raphael himself, who invited him, but not successfully, to work in the Vatican. In Ridolfo's pictures, Mr. Fuseli says, "there is something analogous to the genius of Raphael; the composition, the vivacity of the face, the choice of colours, something ideal in the use of nature, betray similar maxims, with inferior powers." He died in 1560, aged 75.

GHIRNAH, in *Geography*, a river of Hindoostan, which runs into the Taptee; 36 miles S.W. of Burhanpour.

GHISCIOLA, a town of Italy, in the department of the Upper Po; 15 miles E. of Cremona.

GHISTELLES, a town of France, in the department of the Lys, and chief place of a canton, in the district of Bruges; 11 miles S.W. of Bruges. The place contains 2500, and the canton 11,404 inhabitants, on a territory of 182½ kilometres, in 18 communes.

GHIVIRA, a town of Italy, in the department of the Olna; 30 miles N.W. of Milan.

GHIZNI, or GAZNA, an ancient empire of Hindoostan, founded by Abistagi, governor of Korafan, A. D. 960, who revolted from the king of Bucharia. Ghizni consisted chiefly of the tract which composed the kingdom of Baëria, after the division of Alexander's empire; that is, the countries lying between Parthia and the Indus, and south of the Oxus. The Ghiznian empire, subject to the same causes of decay with other unwieldy states of rapid growth, was, in 1158, forcibly divided; the western, and largest part, and which still retained the ancient name of the empire, being seized on by the family of the Gaurides, (so denominated

denominated from Gaur, or Ghor, a province and city lying beyond the Indian Caucasus), while the provinces contiguous to both shores of the Indus, remained to Chusero, or Cusroe, who fixed his residence at Lahore: and even his posterity were, in 1184, driven out of their kingdom by the Gaurides. The death of the emperor Mahomed Gori, in 1205, occasioned a new division of the Ghiznian empire; the Persian part remaining to Eldoze, and the Indian part to Cuttub, who founded the Patan, or Afghan dynasty, in Hindoostan. In 1221 Gengiz Cawn, among his extensive conquests, accomplished that of the empire of Ghizni; putting an end to the dynasty of Charafm, which then occupied that throne, and driving before him the unfortunate Gelali, son of the reigning emperor; who swam the Indus to avoid his fury. The ancient empire of Ghizni is nearly comprehended by the kingdom, known at present by that of Candahar. See CANDAHAR.

GHIZNI, or *Gazna*, a city of Candahar, once the reputed capital of the Ghiznian empire, and placed among the western sources of the Indus, and not far from the Indian Caucasus. The position of Ghizni is erroneously fixed by M. D'Anville in the N.W. extreme of Cabul; whereas it appears to be almost in the very heart of that province. It is termed the "Second Medina," on account of the great number of illustrious persons whose remains have been interred there. Wonderful stories are related concerning its extent and population in ancient times; nevertheless, Baber expresses his surprise at its having ever been pitched on for the seat of any empire. Ghizni is distant about 56½ geographical miles S. by W. from Cabul, about 167½ such miles from Candahar, and about 88 miles from Bamian. N. lat. 33° 35'. E. long. 68° 22'.

GHOBAN. See GOBAN.

GHOER, a town of Holland, in Overijssel, on the Rigge; 10 miles N.N.E. of Borkeloe.

GHOR. See GAUR.

GHORAIB, a town of Arabia, in the country of Yemen; 15 miles E. of Iamlo.

GHROUP, a mountain of Southern Africa. This, and also Nieuweld, are a continuation of the Roggeveld mountain, and join the divisions bearing the same name in the district of Graaf Reynet. They have lately been deserted, on account of the number of Boosjesman Hottentots, who dwell close behind them.

GHOUREBUND, a town, and district of Cabul; 42 miles N.W. of Cabul. N. lat. 34° 55'. E. long. 67° 52'.

GHOUREI, a town of the kingdom of Balk. N. lat. 35° 40'. E. long. 66° 56'.

GHULE EL ALJAIB, a town of Arabia Felix; 10 miles N.N.E. of Chamir.

GHULPAIGAN, a town of Persia, in the province of Irak, taken by the Afghans in 1723; 100 miles N.N.W. of Ispahan. N. lat. 33° 45'. E. long. 50° 40'.

GHUMISCHKANA, a town of Asiatic Turkey, in the government of Trebisond; 50 miles S.S.W. of Trebisond.

GHUNFUDE, a sea-port of Arabia, on the Red sea, belonging to the sheriff of Mecca. All vessels which carry coffee to Jidda are compelled to anchor here, and pay a duty; 145 miles S. of Mecca. N. lat. 29° 7'.

GHUNI, one of the smaller Cape Verd islands, being little more than a rock.

GHURMAN, a town of Persia, in Segestan; 30 miles N.E. of Ferah.

GHYASPOUR, a town of Hindoostan, in Bahar; 20 miles W.S.W. of Chuprah.

GIA, an Italian adverb, used in *Musica* for already, formerly, *cidevant*: as "Gia maestro di cappella del Duomo di Milano," formerly maestro di cappella, or composer, to the cathedral of Milan.

GIABBAR, in *Geography*, a fortress of Asiatic Turkey, in the province of Diarbekir; 120 miles S.S.W. of Diarbekir.

GIACOMELLI GEMINIANO, in *Biography*, of Parma, composed for the theatres of Venice, between the years 1704 and 1736, seven or eight different dramas, written chiefly by Apostolo Zeno and Metastasio. He was the scholar of Capelli; but adopted a more high and slighty style, with which the Venetians were much captivated, before they heard the more graceful and expressive airs of Vinci and Haff.

GIACOMO, Sr. in *Geography*, a town of Italy; three miles S. of Verona.—Alto, a town of the Valchine; two miles N.W. of Chiavenna.

GIACOMO, *St.*, *Valley of*, a valley of Switzerland, which is part of the county of Chiavenna. It is narrow, and watered by the torrent Lira; contains about 10 parishes, is under the jurisdiction of the commissary, and possesses several important privileges that preserve the inhabitants from the oppression which their neighbours endure. All causes are tried in the valley. The criminal statutes are those of Chiavenna, with this difference, that instead of the assessor, the valley chuses four persons, who are always present at the examination; and without whose concurrence, torture cannot be inflicted, nor sentence passed. The valley has its own code of jurisprudence, and courts independent of the commissary, from the decision of which an appeal lies to the diet.

The lower part of the valley produces vines and corn; the upper, rye, barley, and pasture, mixed with large groves of fir and pine.

GIACOMO ARKADEL, in *Biography*, a Netherlander, and a disciple of Jusquin, enumerated by Adam among the singers and composers of the pontifical chapel in the 16th century. He was maestro di cappella some time to the cardinal of Lorraine, and had acquired great fame by his madrigals, of which he published at Venice, between the years 1539 and 1575, five books. In one of which is the celebrated madrigal, "Il bianco e dolce Cigno cantando muore," which was in high favour all over Europe.

GIADEN, in *Geography*, a town of Arabia, 60 miles W. S.W. of Mecca.

GIADILA, a town of Arabia, in the province of Nedsjed, 90 miles S.W. of Karitim.

GIADRI, a town of Albania, on the Drimo; eight miles N. of Alessio.

GIAGAS of Africa. See JAGAS.

GIAGH, or JEHAGH, a cycle of twelve years, in use among the Turks and Cathayans.

Each year of the giagh bears the name of some animal; the first that of a mouse; the second, that of a bullock; the third, of a lynx or leopard; the fourth, of a hare; the fifth, of a crocodile; the sixth, of a serpent; the seventh, of a horse; the eighth, of a sheep; the ninth, of a monkey; the tenth, of a hen; the eleventh, of a dog; and the twelfth, of a hog.

They also divide the day into twelve parts, which they call giaghs, and distinguish them by the name of the same animals. Each giagh contains two of our hours, and is divided into eight *leb*, as many as there are quarters of hours in our day.

GIALAKOVA, in *Geography*, a town of European Turkey, in Romania; 60 miles N.E. of Filippopol.

GIALLOLINO, in *Natural History*. See NAPLES *Yellow*.

GIAMANI,

**GIAMANI**, in *Geography*, a town of Persia, in the province of Chulistan; 28 miles S.S.W. of Sulter.

**GIAMBASH**, a town of Asiatic Turkey, in Natolia; 25 miles S.S.E. of Smyrna.

**GIANAH**, a town of Persia, in the province of Kermand; 50 miles E. of Singian.

**GLANCAZZO**, Str. a town of Naples, in the province of Otranto; 12 miles S.W. of Brindisi.

**GIANNONE**, *Petrus*, in *Biography*, was born at or near Naples about the year 1630. He was educated for, and practised in, the law, but was much more distinguished as an historian. In 1723 he wrote a "History of Naples," in four volumes 4to. The style is pure, but the freedom with which he discussed several topics relating to the origin of the papal power gave so much offence to the court of Rome, that he was obliged to exile himself from his native country. He found an asylum with the king of Sardinia, who did not, however, dare to avow himself his protector, but chose rather to represent his situation as that of a prisoner. Giannone died in Piedmont in 1743. Extracts from his history were afterwards printed in Holland under the title of "Anecdotes Ecclesiastiques." His posthumous works were given to the world in a quarto volume, containing, among other miscellaneous matter, his profession of faith, and a justification of his history.

**GIANOTTI**, a performer on the double-bass in the opera at Paris, from the year 1739 to 1767, who published, in 1759, a treatise built on the principles of Rameau, entitled "Guide du Compositeur," the Composer's Guide; a work much esteemed by the followers of Rameau. The author of this tract having been long in the practice of explaining the system of the fundamental bass to his scholars, has drawn up his own work in a clear and intelligible manner.

**GIANNUTI**, in *Geography*, a small island in the Mediterranean sea, near the coast of Italy. N. lat. 42° 24'. E. long. 11° 20'.

**GIANT**, γίγας, a man of extraordinary, enormous stature and bulk.

The reality of giants, and of nations of giants, is much controverted among the learned. Travellers, historians, and relations, both sacred and profane, furnish various instances of them; a great part of which naturalists and antiquaries set aside.

Those among the ancients who speak of giants, as historians, and affirm there were such beings, are Cæsar, de Bello Gallico, lib. i. Tacitus, de Morib. Germanor. and Annal. lib. ii. Florus, lib. iii. cap. 3. St. Augustine, de Civit. Dei. lib. xv. cap. 9. and Saxo-Grammaticus, at the end of his preface: among the moderns, Hieron. Magius, Miscellan. de Gigantibus; Chassagonus, de Gigantibus; Kircher, Mund. Subterr. lib. viii. sect. ii. cap. 4. and so many others, that Stephanus, in his notes on Saxo-Grammaticus, affirms, nothing can be more extravagant than to deny or allegorize the authorities we have concerning them.

Dr. Derham observes, that though we read of giants before the flood, Gen. vi. 4. and more plainly after it, Numb. xiii. 33. yet it is highly probable the size of man has always been the same from the creation; for as to the Nephilim, Gen. vi. the ancients vary about them, some taking them for monsters of impiety, atheism, rapine, tyranny; as to those, Numb. xiii. who were evidently spoken of as men of a gigantic size, it is probable the fears of the spies might add to their bulk.

Be this as it will, it is manifest, that in both these places giants are spoken of as rarities and wonders of the age, not of the common stature: and such instances we have had in all

ages. But it is not at all improbable, that the first men were of a strength and stature superior to those of mankind at present, since they lived a much longer time; long life being commonly the effect of a strong constitution. There are many fabulous relations: such as we take to be that of Theotocchus, who is said to have been dug up anno 1613, and to have been higher than the trophies, and twenty-six feet in height: and no better we suppose: the giants to have been, of whom Ol. Magnus gives an account in his fifth book; such as Harthen and Starchater, among the men; and among the women, "reperta est (saith he) puella—in capite vulnerata, mortua, induta chlamyde purpurea longitudinis cubitorum 50, latitudinis inter humeros quatuor." Ol. Mag. Hist. lib. v. cap. 2.

But, as for the more credible relations of Goliath (whose height was six cubits and a span, (1 Sara xvii. 4.) which, according to bishop Cumberland, is somewhat above eleven feet English, of Og, king of Basan, (Deut. iii. 11.) whose bed was nine cubits long and four wide, of Maximinus the emperor (who was nine feet high), and others in the reign of Augustus and other Roman emperors, of about the same height; to which might be added the dimensions of a skeleton, dug up in the place of a Roman camp, near St. Alban's, by an urn inscribed Marcus Antoninus, of which an account is given by Mr. Chiefden, who judged, by the dimensions of the bones, that the person was eight feet high, Phil. Trans. N° 333; these antique examples and relations, we say, may be matched, nay outdone, with modern ones; of which we have divers in J. Ludolph. Comment. in Hist. Æthiop. lib. ii. cap. 2. sect. 22. Magius, Conringius, D. Hakewel, and others; the last mentioned writer speaks from Nancez, of porters and archers belonging to the emperor of China, fifteen feet high, and of others from Purchas, of ten and twelve feet high, and more. See that learned author's Apol. p. 208.

The existence of a race of men above the common stature, on the coast of Patagonia in South America, has been the subject of dispute for the two last centuries. In one century almost all navigators, of every country, affirmed that there were such persons; and in the next the fact is denied by the greater number, and their predecessors are treated as timid or boasting fabulists. The Ynca Garcilasso de la Vega, in his history of Peru, relates, that according to a tradition universally received, a number of vessels or junks came to St. Helena with a company of giants on board, of a stature so enormous, that the natives of the country were not higher than their knees; that their eyes were as broad as the bottom of a plate, and their limbs proportionably large. But these are fables, similar to those relative to the same subject in other parts of the world. See GIANTS' bones.

Turner, the naturalist, reports that he had seen, near the river Plata, on the coast of Brasil, a race of giants, who went stark naked, one of whom was twelve feet high; but he acknowledges that he saw no others so tall. The ocular witnesses on the affirmative side of the question are, Magellan, Loaísa, Sarmiento, and Nodal, among the Spaniards; Cavendish, Hawkins, and Knivet, among the English; Sebald, De Noort, Le Maire, and Spilberg, among the Dutch; and among the French, those who went in the expedition from Marseilles and St. Maloes, in the year 1704.

Knivet affirms that he measured several dead bodies, which he found buried at Port Desire, which were from fourteen to sixteen spans high; and that he had frequently seen at Brasil one of the Patagonians, who, though a youth, measured no less than thirteen spans; and that the English prisoners at Brasil assured him, that they had seen many men of the same gigantic stature upon the coasts of the Strait: this account is also confirmed by Sebal de Welt, and Oliver de Noort. Aris:

Clafz, a commissary on board Le Maire's fleet, declares that he found, in the sepulchres on the coast of Patagonia, the bones of men who were between ten and eleven feet high. Nodal and sir Richard Hawkins merely relate, that these savages were a head taller than the inhabitants of Europe, and of such a stature, that the people on board their vessels called them giants.

Those who bear testimony to the contrary, are Winter, the Dutch admiral Hermite, Froger in De Gemes's Narrative, and sir John Narborough. Sir Francis Drake also is silent with respect to the stature of the inhabitants of Patagonia; but Winter positively affirms, that the accounts of their being giants are falsehoods invented by the Spaniards. Narborough measured the skulls and the print of the feet of the savages on the coast of the strait of Magellan, which, he says, were of the common size: and he had often seen companies of them at Port St. Julian, who were neither taller nor bigger than other men. However, it may be observed in general, that the greater part of those who hold the affirmative in this question, speak of people that inhabited the desert coasts of Patagonia to the east and west; and that, on the contrary, those who hold the negative, speak of those who inhabit the strait upon the sides of the utmost point of America to the north and south. Frezier relates, not from his own knowledge, but from the testimony of eye-witnesses, that there was, at a considerable distance within the country from the coast of Chili, an Indian nation, called by their neighbours Caucohuas, who some times came down to the Spanish settlements, that were more than nine feet high, and were the same race with the Patagonians who live on the eastern coast. It appears from various relations, that the inhabitants of the two borders of the strait are of the common stature, and that the race, distinguished by the name of Patagonians, make their constant residence upon the desert coasts, scarcely accessible to any but themselves; and when European ships frequented the strait, they removed and settled in the interior part of the country: however, the current testimony of late navigators, particularly commodore Byron, captain Wallis, and captain Carteret, will put an end to the doubts that have been hitherto entertained of the existence of such persons. Commodore Byron, who visited the coast of Patagonia, in 1764, speaks of the inhabitants as of a gigantic stature; but he did not measure any of them, and only concluded, by the proportion of their stature to his own and that of his companions, that they could not be less than six and a half, or seven feet in height, and proportionably strong and bulky. Captain Wallis had an interview with these people in 1766, and found, by measuring them, that the stature of the greater part of them was from five feet ten inches to six feet, though there were some who were six feet five and six feet six inches, and one who was six feet seven inches. Captain Carteret, who attended captain Wallis on this occasion, confirms the above account in his letter to Dr. Maty. See Phil. Trans. vol. lx. art. 2. p. 20, &c. See Hawke's Voyage, vol. li. Introd. and p. 28. 154.

GIANTS, *Rebel*, in *Ancient Mythology*, were the sons of Terra, or the Earth, by Caelus, who made war against Jupiter and the celestial deities, to avenge the defeat of the Titans. These giants are represented as of an enormous height and size, having a wild and dreadful aspect, and possessed of strength proportioned to their bulk: each of them had a hundred hands, and serpents instead of legs. Being determined to dethrone Jupiter, they reared Mount Ossa upon Pelion, and Olympus upon Ossa, and from thence attacked the gods with huge rocks, some of which fell into the sea and became islands, and others fell on the earth and

formed mountains. Jupiter summoned a council of the gods, and being informed that it was necessary to obtain the assistance of some mortal, with the advice of Pallas he called up Hercules, and with the aid of this hero, exterminated the giants Enceladus, Polybotes, Alcyon, Porphyryon, the two sons of Alaxus, Ephialtus, Othus, Eurytus, Clytus, Tythus, Pallas, Hippolitus, Agrius, Thoon, and Typhon, the kill of whom it was more difficult to vanquish than all the others. Jupiter having thus gained a complete victory, cast the rebels down to Tartarus, where they were to receive the full punishment of their enormous crimes: according to the account of some of the poets, he buried them alive under Mount Etna and different islands.

For the explanation of this fable, some have supposed that Jupiter (for whose history, see JUPITER) dethroned the robbers that infested Thessaly, and that these are the pretended giants; for we have already observed (in the preceding article) that the appellation "Nephthim," occurring in scripture, and translated giants, signifies people addicted to all kinds of licentiousness and violence, or robbers and ruffians. Jupiter, when he left Crete to visit the other parts of Greece, usually resided on mount Olympus, where he had probably built a strong citadel. This mount Olympus, highly elevated, was afterwards taken for heaven itself, and the most ancient poets, especially Homer, so describe it. The banditti now mentioned, determined in their attack on that prince, besiege him in his citadel, which afterwards gave rise to the fiction of their having attempted to scale heaven, and of their having made an assault upon it. It is added, that with this view they piled Ossa upon Pelion, importing, as it is conjectured, that they had fortified these two mountains, which are also in Thessaly, and at no great distance from Olympus, whither they retired after their excursions, and kept Jupiter's garrison in awe. For other particulars, see Banier's Mythology, vol. iii. See also TITANS.

GIANTS' *Bones*, a name too hastily given by the vulgar to certain bones and parts of skeletons, of an enormous size, found in England and other places. Of all the numbers of these, which have been publicly shewn about as wonders in nature, not one but has proved, on examination, a bone of an elephant, or else of a whale, or of some other terrestrial or aquatic animal now perhaps extinct; the fact, however, is usually the case, as the bones of elephants are much more frequently found buried in the earth than those of the whale.

Sir Hans Sloane mentions a vertebra of the loin of a whale sent him from Oxfordshire, where it was dug up under ground, and afterwards used as a stool to sit upon, and vulgarly supposed part of a human back-bone. Now, if the whole size of the body had been calculated from this piece, the account would have presented such a size as would have far exceeded all the fabulous stories of giants' skeletons extant in the world.

Many skeletons of this kind have been found which have been called the skeletons of giants: such are those of Philobrotus, which are said to be the bones of men of twelve, twenty, and even thirty cubits high; that found in a mountain of Crete, and mentioned by Plato and Pliny, forty-six cubits high; another of sixty cubits, found near Tanager in Mauritania, mentioned by Plutarch and Strabo, and supposed to be the skeleton of Anteus; the skeleton of Pelion, the son of Evander, found in Rome, and said to be taller than the walls of that city; another, found in England in 1171, fifty feet long. St. Austin alleges, in proof of the existence of giants before the flood, a grinder tooth, which he saw on the shores of Ubia, which was in reality that of

an elephant. The tooth in the church of St. Christopher, at Hispalla, and the shoulder bone of St. Christopher, preserved in a church at Venice, are of the same kind. The tooth preserved and shewn at Antwerp is only the grinder of an elephant; and another, belonging to a skeleton which was dug up near Tunis in 1630, was sent to the learned Pierefe, who took the impression of it in wax, and comparing it with the tooth of an elephant shewn near the place, found it to be of the same shape and size. Sir Hans Sloane has given an accurate and learned account of several other mistakes on this subject, for which we must refer to the *Philos. Transact.* N. 404. However, Monf. Le Cat, in a memoir read before the Academy of Sciences at Rouen, recites a number of instances, in which skeletons, or parts of skeletons, of an uncommon magnitude, have been found; these have been examined by anatomists, he says, and have been by them reputed real bones; and hence he infers the existence of giants.

*GIANTS Causeway*, a name given in the county of Antrim, on the north coast of Ireland, to a vast quantity of that kind of basalt, (see *BASALTES*), which stands in columns, and runs out a great way into the sea.

The ignorance of the nature of this stone, has occasioned this great pile of it to be supposed artificial and the work of giants, once inhabitants there. But whoever considers this amazing series of columns, will be soon convinced no human hands could have formed them, and will find an accuracy in their figures greater than could have been expected from the most curious hand. The length of the several columns, and their joints so regularly placed in series, and the niceness of their articulations, by which no space or vacuity is left between, are wonderful.

This causeway forms a kind of mole, or quay, projecting from the base of a steep promontory some hundred feet into the sea; and the perpendicular columns of which it is formed exhibit an appearance not unlike a solid honey-comb. The single columns are irregular prisms of from four to eight sides; but the pentagonal and hexagonal are by far the most numerous, and, when examined, they are found just such as must necessarily be required in the places where they stand to fill up between others, so as to leave no vacuity. Each of these columns is separable into a series of joints, each of which is so well fitted to the place, that the joining appears only a crack or crevice in the stone: yet these are regularly articulated, there being always a convexity on one part, and a socket in the other to receive it, so that the joints cannot slip off from one another; besides which, the angles of one frequently shoot over those of the other, so that they are completely locked together, and can rarely be separated without a fracture of some of their parts. The depth of the concavity is generally about three or four inches. These hollows are of great use to the neighbouring poor, for they make a kind of salt pans of them, and thus very easily procure themselves a kind of bay-salt in summer. They fill these little basons with sea-water at high tides, and the heat of the sun and of the stone contributing greatly to the evaporation, as well as the shallowness of the bason, the whole humidity is found evaporated in the time of four tides, and they take out the salt ready for use. The length of these joints is various; they are from eight to four and twenty inches long, and for the most part longer towards the bottom of the column; they are generally from fifteen to twenty inches in diameter.

The triangular and square columns are fewer in number than the others, but they stand principally in the inner part of the large series, and are seldom seen, unless searched after by a curious eye.

The regular figure of the stone, composing this causeway, is not more wonderful than its quantity. The whole country for many miles being full of it, and a vast mass running far into the sea: for, besides what vulgarly goes by the name of the Giants Causeway, which is itself of vast extent, there are great numbers of the same pillars at distances in other places.

There are two other smaller and imperfect causeways to the left hand of the great one, and farther in the sea, a great number of rocks shew themselves at low water, which appear plainly all to consist of the same sort of columns. In going up the hill from the causeway there are found, in different places, a vast number of the same columns; but these do not stand erect, but are laid slanting upwards in different angles and directions. Beyond this hill, eastward, also, at several distances, there stand a great number of the same pillars, placed straight and erect, and in clusters of different sizes. These are seen scattered, as it were, over the several parts of the hills.

One parcel of them is much admired, and called by the country people the looms of the organs. It stands in an elegant form, and faces the bottom of the hill. The columns, of which this cluster consists, are about fifty in number, and they are so nicely put together, that the tallest stand in the middle, and the shorter gradually on each side of it to the end, so that they look like the pipes of a church organ viewed from the front. The tallest one of all these, which stands exactly in the centre, is forty feet high, and consists of forty-four distinct joints.

What is emphatically called the Giants Causeway is, in fact, a small portion of that vast basaltic area, of which the promontories of Bengore and Fairhead consist, and which extends over a great part of the neighbouring country. These two great promontories, which have been examined by Hamilton and lately by Dr. Richardson, stand at the distance of eight miles from each other, and are the leading features of the whole coast of Antrim. The former of them, situated about seven miles West of Ballycastle, represents itself at a distance, and in profile, as an extensive headland, running out from the coast a considerable length into the sea; but, strictly speaking, it is made up of a number of lesser capes and bays, the whole of which forms what the Frisians denominate the headland of Bengore. These capes are composed of a variety of different ranges of pillars and a great number of strata, which from the abruptness of the coast, are very conspicuous, and form an unrivalled pile of natural architecture, in which all the neat regularity and elegance of art is united to the wild magnificence of nature. The promontory of Fairhead raises its lofty summit more than 500 feet above the sea, forming the eastern termination of Ballycastle bay. It presents to view a vast compact mass of rude columnar stones, the forms of which are extremely gross, many of them being near 150 feet in length, and of a coarse texture. At the base of these gigantic columns lies a wild waste of natural ruins, of an enormous size, which, in the course of successive ages, have been tumbled down from their foundation by storms, or some more powerful operations of nature. The massive bodies have sometimes withstood the shock of their fall, and often lie in groups and clumps of pillars, resembling many of the varieties of artificial ruins, and forming a very novel and striking landscape. Besides these two promontories, there are several other parts of the county of Antrim which exhibit a similar columnar basaltic structure. Thus the mountain of Dunmull, between Coleraine and the river Bush, abounds in such basalt, particularly at the craigs of Ilamore, where two different ranges of columns may be discovered; they may be seen



also at Dunluce-hill, near the castle of Dunluce; in the bed of the river Bush, near the bridge of Bush-mills; on the summit of the mountain of Croaghmore; in many parts of the high land over Ballintoy; in the island of Raghery, opposite Ballycastle, and various other places, through an extent of coast about fifteen miles in length and two in breadth. Beyond this tract, which abounds in perfect pillars, an attentive observer will be able to trace the same materials and stratification in very distant parts of the country, as far as the northern shore of Loughneagh, and the mountains of the county of Derry; in many places of which imperfect columnar forms may be observed; so that the great cause which generated this species of flow has been exerted through a space of more than forty miles in length and twenty in breadth; that is, through above eight hundred square miles.

Of the different varieties observable in the columns that compose the Giants Causeway and those of the other parts of the coast, the following comparative view has been given by Mr. Hamilton. 1. With respect to form and magnitude: the pillars of the causeway are comparatively small, not very much exceeding one foot in breadth and thirty in length; sharply defined, neat in their articulation, with convex or concave terminations to each joint. In many of the capes and hills they are of larger size, more imperfect and irregular in their figure and articulations, having often flat terminations to their joints. At Fairhead they are of a gigantic magnitude, sometimes exceeding five feet in breadth and a hundred in length; often apparently destitute of joints altogether. 2. With respect to situation: the pillars of the Giants Causeway stand on the level of the beach, from whence they may be traced, through all degrees of elevation, to the summit of the highest grounds in the neighbourhood, as at the old fort of Dunmull, and on the top of Croaghmore, six hundred feet at least above the level of the sea. 3. With respect to disposition and arrangement: at the causeway, and in most other places, they stand perpendicular to the horizon; in some of the capes, and particularly near Uthet harbour in the isle of Raghery, they lie in an oblique position; at Doon-point, in the same island, and along the Ballintoy shore, they form a variety of regular curves. 4. With regard to colour and grain: the Giants Causeway basalt is blackish, close, and uniform; its varieties of colour are blue, reddish, grey; and of grain, all that can be supposed from extreme fineness to the coarse granulated appearance of a stone, which resembles imperfect granite abounding in crystals of horn, chiefly black, though sometimes of various colours. 5. With respect to texture: though the Giants Causeway basalt be in general compact and homogeneous, yet the upper joint of each pillar, where it can with certainty be ascertained, is always rudely formed and cellular. The gross pillars also, in the capes and mountains frequently abound in these arches through all their parts, which sometimes contain fine clay and other apparently foreign bodies: and the irregular basalt beginning where the pillars cease, or lying over them, is, in general, extremely honey-combed, containing in its cells crystals of zeolite, little morsels of fine brown clay, sometimes very pure steatite, and in a few instances bits of agate.

The inland pillars, upon the whole, differ from those which run into the sea, and are called the causeway, only in the following particulars; some of the inland pillars are much larger than those of the causeway, being two feet and a half in diameter, and among these there are only found such as have three, four, five, and six sides, none of them having yet been found to have seven or eight sides, as

many of those of the causeway itself have. And, finally these inland pillars, though composed of as many joints as those of the causeway, yet have not that curious articulation of the ball and socket, but are only joined by the laying one smooth surface on another; so that a joint of a single column may be slipped off from the rest, by a considerable force pressing against it. There is something like this observable also in some of the columns of the causeway itself; for among the numbers which are jointed by the ball and socket, there are some which only adhere by being applied surface to surface. This is found only in a few of the columns, however, and they always stand within the clusters, and are composed of less than seven sides. In these also the joint is not made by the application of two horizontal planes, but by such as slant, so that it looks very like the breaking of an entochus or asteria.

The joints, as we see the pillars above the surface, are usually as many in number as the pillar is feet high; but they are not regularly each of a foot long, for they are shortest at the upper part of the columns, and run gradually longer and longer as they approach the base. This is observed both in the inland columns, and in those of the causeway; but though the length of the joints differs, their convexities and hollows are much the same in all parts of the column.

There are other basaltic columns, similar to those above described, in our own island; particularly at Staffa, one of the western islands of Scotland; in the mountain of Cullindris, near Dolgelly, in Merionethshire; where they probably form a group as in other places. Mr. Strange has given an account of two groups of prismatic basaltic columns, which he discovered in the Venetian state in Italy; one at Monte Rosso, about seven miles nearly south from Padua, and the other in Monte del Diavolo, near San Giovanni Illarime, about ten miles north-west of Vicenza. The form of the latter is nearly circular, resembling that of the Giant's Causeway; that of the former approaching more to an oblong or oval figure: the columns of San Giovanni are much about the same size, and measure about a foot in diameter; those of Monte Rosso are very unequal, some being a foot, while others scarcely exceed three inches in diameter: that of both these Venetian groups manifest all the varieties of prismatic forms observable in the Giant's Causeway, and other such groups; but they are commonly of five, six, or seven sides, and the hexagonal form seems mostly to prevail. The texture of the former sort is solid and uniform: the surface smooth, and the internal parts of a dark monogrey colour; those of Monte Rosso have a rough and lumpy surface; and, when broken, manifest a variegated colour, and unequal texture of parts; resembling an inferior sort of granite, of which the mountain is formed, and which serves as a base for this range of columns. Other groups of articulated basaltic columns have also been observed in the province of Velay and Auvergne in France; particularly by M. De Varennes, at Bland near Langueac, and by M. De Lamarcs, near le Mont d'Or; and M. Sage mentions another near St Alcon, in the same province. Kircher has long ago described a group of the same columns near Vitellia in Italy. Mundus Subterraneus, lib. viii. cap. 9. &c. And Mr. Strange mentions another at Caid Nuova, near the Euganean hills, about four miles further west of that of Monte Rosso.

For the various controversies with regard to the origin of these basaltic columns, and of the hexastropæck, in general, see Traut.

GIANTS' HEAD, in Geography, a cape on the coast of the

of the island of St. Christopher, a little to the east of Ragged Point.

GIAR, a town of Persia, in the province of Farfistan; 70 miles E. of Schiras.

GIAR, *Al.* See DSJAR.

GIAR *Abubar*, in *Botany*, a name given by Avicenna, Serapion, and the rest of the Arabian writers, to the potamogeton of those times. This is translated by some the water-lily, but that is founded on an error: it is certain that the plant thus called by the Arabians was very different from the potamogeton of our times. Avicenna tells us, it had flowers resembling those of the water-lily; and it seems either to have been the *fagitta aquatica* or water arrow-head, or else the *butomus*, or some of the smaller species of *nymphaea*.

GIARAF, CAPE, in *Geography*, a cape on the coast of Tripoli. N. lat. 34. E. long. 11°.

GIARDINI, FELICE, in *Biography*, in many respects the greatest performer on the violin during the last century. He was a native of Piedmont; and when a boy was a choir-master in the Duomo at Milan, under Paladini, of whom he learned singing, the harpsichord, and composition; but having previously manifested a disposition and partiality for the violin, his father recalled him to Turin, in order to receive instructions on that instrument of the famous Somis. But though his preference of the violin, upon which he soon became the greatest performer in Europe, seems a lucky circumstance, yet he had talents which would have made him a superior harpsichord player, had he continued to practise that instrument; but he used to say, that he was perfectly cured of that vanity at Paris, by the performance of Madame de S. Maur, a scholar of Rameau, who played in such a manner, as not only made him ashamed of his own performance, but determined him never to touch the instrument again in serious practice. He went to Rome early in his life, and afterwards to Naples, where, having obtained a place among ripienos in the opera orchestra, he used to flourish and change passages much more frequently than he ought to have done. "However," says Giardini, of whom we had this account, "I acquired great reputation among the ignorant for my impertinence; yet one night, during the opera, Jomelli, who had composed it, came into the orchestra, and seating himself close by me, I determined to give the *maestro di cappella* a touch of my taste and execution; and in the symphony of the next song, which was in a pathetic style, I gave loose to my fingers and fancy; for which I was rewarded by the composer with a violent slap in the face; which," adds Giardini, "was the best lesson I ever received from a great master in my life." Jomelli, after this, was however very kind, in a different way, to this young and wonderful musician.

Giardini came to England in the spring of 1750. His first public performance in London, at which we were present, was at a benefit concert for old Cuzzoni, who sung in it with a thin cracked voice, which almost frightened out of the little theatre in the Hay-market the fans of those who had perhaps heard her at the great theatre in the same street, with extasy. But when Giardini played a solo and concerto, though there was very little company, the applause was loud, long, and furious, as nothing but that bestowed on Garrick had ever equalled. We had met him the night before at a private concert, with Goadswill and Trudi, at the house of Hospital Tucker, etc. who was himself one of the best distant performers on the violin at that time; and we were all equally surprised and delighted with the various powers of Giardini at so early a period of his life; when, besides solos of his own composition of the most brilliant

kind, he played several of Tartini's, in manuscript, at sight, and at five or six feet distance from the notes, as well as if he had never practised any thing else. His tone; bow; execution; graceful carriage of himself and his instrument; performing a MS. piece of a young composer in the room, he declared that Giardini had so improved it as to make it better than he intended, or had imagined it to be in the warm moments of conception; and lastly, playing variations extempore, during half an hour, upon a new but extraordinary kind of birth-day minuet, which accidentally lay on the harpsichord—all this threw into the utmost astonishment the whole company, who had never been accustomed to hear better performers than Felling, Brown, and Collet! Of his academy, scholars, manner of leading at the opera and oratorio, performance in private concerts, compositions vocal and instrumental, we shall say nothing here, lest our praise should be too much for others, and too little for ourselves.

He soon got possession of all the posts of honour in this country. He was engaged and caressed at most of the private concerts of the principal nobility, gentry, and foreign ministers; at the Cattle and King's-Arms concert in the city; and in 1753, he was placed at the head of the opera band; in which he introduced a new discipline, and a new style of playing, much superior in itself, and more congenial with the poetry and music of Italy, than the languid manner of his predecessor Felling; who, except one or two seasons, when Veracini was at the head of the orchestra, had led the opera band from the time that Castrucci was dismissed, till the arrival of Mingotti.

In 1756, on the failure and flight of the *Impresario* or undertaker of the opera, Vancelli, the Mingotti, and Giardini joined their interests, and acquired for a while the sovereignty of the opera kingdom, by which gratification of their ambition, these two great performers were soon brought to the brink of ruin, as others had been before them.

But though great applause was acquired, and appearances were favourable, yet the profits to the managers were so far from solid, that they found themselves involved at the end of the season in such difficulties, that they were glad to resign their short-lived honours, and shrink into a private station.

Giardini, while in the opera management, besides arranging pasticcios, set several entire dramas; but though he had got great a hand on his instrument, so much fancy in his cadences and solos, yet he had not sufficient force or variety to supply a whole evening's entertainment at the Lyric theatre. Yet after he had resigned his throne in the orchestra, he frequently threw in a single air or rondeau into the operas of other masters, which was more applauded than all the rest of the drama; of this kind were the favourite airs of "Voi amanti," and "Ah non so perche tu sei, &c."

In 1762, on Mattei quitting the management of the opera, in spite of former miscarriages, Giardini and Mingotti again resumed the reins of opera government. But after struggling two years against the stream, during the decline of Mingotti's favour, and after an unsuccessful season, at the end of 1763, Giardini and his partner again abdicated their thrones. From this period, Giardini, always hovering over his former Lyric kingdom, without the power of invading it, or bringing about a reformation, was forced to content himself with teaching ladies of rank and fashion to sing, and the produce of a great annual benefit. He continued here, rivivalled, as a leader, a solo player, and a composer for his instrument, still augmenting the importance of his instrument and our national partiality for the taste of his country, till the admirable productions and great performers of Germany began

began to form a Teutonic interest and Germanic body here, which, before Giardini's departure from London, became very formidable rivals to him and his Roman legion.

At the end of 1784, he went to Italy, and resided a considerable time at Naples, with sir William Hamilton, one of his first scholars on the violin after his arrival in England.

Remaining on the continent till the summer of 1789, Giardini returned to this country, bringing with him a female pupil and her whole family, attempting a burletta opera at the little theatre in the Haymarket, while the great opera-house, which had been burned down, was rebuilding; but his *prima donna* not being approved, their speculation failed, and he had her and her whole family on his hands. During his absence the public had learned to do without him, and reconciled themselves to his loss; his health, hand and eyes were impaired; he was dropical, his legs were of an enormous size, and little of his former superiority on his instrument remained, but his fine tone. He composed quartets that pleased very much, but in which he never played any other part in public than the tenor. The style of music was changed; he printed many of his old compositions which used to please; but now could gain neither purchasers nor hearers, so that about the year 1793, he went to Petersburg with his burletta troop; which seems to have pleased as little there and at Moscow, as in London; and he is said to have died in this last city in great wretchedness and poverty!

But before we try to account for this melancholy termination of so brilliant a career, let us endeavour to do justice to his professional abilities.

It is the business of every artist to endeavour to arrive at the head of his profession during the age in which he lives, but no one can be expected to aspire at superiority over all mankind, past, present, and to come. Homer, our own Shakespeare, and Milton, have, perhaps, succeeded in that wish, if ever they formed it, and Dryden and Pope have gained two out of three of these eras. If Giardini has been surpassed by a few in taste, expression, and execution, his tone and graceful manner of playing are still unrivalled, nor does any one, of all the admirable and great performers on the violin, surpass all others so much at present, as Giardini did, when at his best, all the violinists in Europe.

That a man with such talents and intellects as art and nature scarcely ever allowed to the same individual, who might have realized 40 or 50,000*l.*, should, by extravagance, caprice, and a total want of benevolence and rectitude of heart, die a beggar, unfriended and unpitied, is scarcely credible! It is painful to probe the private character of such a man; yet it should not be concealed. Truth and morality require it to be recorded. The kings of Egypt used to be tried after their decease.

And if young musicians of great talents, who are prone to deviate from propriety of conduct, should chance to read this article, it may serve as a beacon, and remind them of the possibility of surviving favour and talents, however great; and terminating their existence in misery and mortification.

A respectable professor, who, from Giardini's first arrival in England, was constantly attached to him, and a sincere admirer of his talents, his wit, and even the ingenuity of his spleen and spite; before he quitted this country in 1784, delineated his character in the following manner, a copy of which came lately to our hands, accidentally.

*Sketch of the private character of a great musician.*—"There exists a man who would rather gain half a crown by superior subtilty and cunning, than a guinea by usual and fair means; who is of so difficult a commerce, that the utmost circum-

spection, attention, and complaisance, can only prevent an open rupture, but never put him off his guard; or warm his heart with the faintest glow of friendship; so capricious and spleetic, that he has had disagreements and quarrels with all the best personages, as well as professors of the same art, in the nation, with whom he has had any intercourse; yet such are his talents, and extraordinary qualities, that, in a short time, all else is forgotten, and those whom he had offended, are as ready to court his acquaintance as ever; though his rank in his profession and great abilities should set him above the envy and petulance of indigent inferiority; yet the success of any one of his acquaintances is torturing and intolerable to his mind, as the goat or stone could be to his body. He can bear no musician who does not solely depend on his favour, whom he can lift up and put down with a *coup de baguette*, bring into light, or extinguish, at pleasure. He seems, himself, to despise all favour from superiors or even equals, yet he is constantly at war with favourites of every kind, public and private. His disposition is so truly diabolical, that, preferring the evil principle of the Manicheans to the good of the Christians, if it is a matter of indifference to his interest, whether he shall serve or injure an individual, he would always chuse the latter. He has constantly trifled with fortune as well as favour, and having, in the course of his life, acquired great sums, is indigent, and though so much courted, has not one friend; with the brightest intellects, and the clearest head for business, his temper renders it so impossible for any enterprize to thrive under his direction, that the most favourable and auspicious beginnings constantly ended in enmity and misfortune. He is as inveterate and powerful an enemy to the opera, oratorio, pantheon, and public and private conceits, when they are not under his direction, as an ex-minister usually is to the government; and yet, notwithstanding the attractions of his performances, abilities as a composer, and experience as a manager, so much are his tricks and tyranny held in abhorrence by patentees and proprietors, that they would shut their shops, rather than open them by his assistance. His interest is now as totally annihilated in the nation, as that of the Stuart family, who, whatever convulsions or revolutions were to happen in the state, would never be called into power."

GIARECAN, in *Geography*, a town of Grand Bactaria; 45 miles N. of Vethgerd.

GIARGA, a town of the island of Corsica; nine miles E. of Calvi.

GIARITCHAS, a group of small islands, among the Moluccas. N. lat. 0 3. E. long. 127 18.

GIARMAL, a town of Hungary; 20 miles E.S.E. of Levens.

GIAROLA, in *Ornithology*. See *ATATA LALIA*.

GIAROLO, a name by which a small bird of the falcon kind, remarkable for its white tail, is known in the park of the Duke of Talar. Aldrovandus has called it the *chalcus testis*. See *TRINGA albifus*.

GIARUD, in *Geography*, a town of Persia, in the province of Kerman; 20 miles W. of Rumed.

GIATURA, a town of the kingdom of Candahar; 25 miles S.W. of Candahar.

GIAYAN, a town of Persia, in the province of Gegeilan; 25 miles N.E. of Kir.

GIAT, a town of France, in the department of the Pay-de-Dôme; 27 miles W. of Clermont.

GIWENNA, a town of France, in the department of the Po, situated at the foot of the Cottian Alps, near the Sangou: surrounded with an ancient wall having four gates.

and distinguished by its agreeable situation and salubrious air; 15 miles W. of Turin

**GIAUF**, **AL**, a district of Egypt, in the S.E. part of the Delta.

**GIAVI**, a town of the island of Sardinia; 21 miles E.S.E. of Algeri.

**GIAUKIRI**, a town of Asiatic Turkey, in Natolia, anciently "Sigeum," chiefly inhabited by Greeks.

**GIAZA**, a town of Italy, in the Veronese; 14 miles N.N.E. of Verona.

**GIB**, in *Agriculture*, a sort of sick with a hook at the end, which is sometimes useful in making and repairing hedges, and for various other purposes.

**GIB**, in *Mechanics*. See **CRANE**.

**GIBS**, or *Tokings*, in *Mining*, are pieces of wood from two to four or more feet long, with a bird's-mouth or notch cut in each end, that are placed as struts between the four upright poles, at the corners of square or rectangular shafts, which are supported with wood, instead of being gined or bricked.

**GIBAU**, in *Geography*, a town of Moravia, in the circle of Olmutz; eight miles N.E. of Olmutz.

**GIBBWAYS**, an Indian tribe residing in Upper Canada, on the E. side of Detroit river, opposite to fort Gibraltar.

**GIBBEN**, a town of the duchy of Courland; 32 miles N.E. of Pilten.

**GIBBETHON**, in *Scripture Geography*, a city of Dan, allotted to the Levites (*Josh. xxi. 23.*); probably the same as *Gabbata*; 12 miles from Eleutheropolis. Here they shewed the tomb of the prophet Habbakuk.

**GIBBON**, **EDWARD**, in *Biography*, was born at Patney in 1737. His father was a gentleman of fortune, and some years member of parliament. The subject of this article was a very delicate and sickly child, inso-much that his parents had but little hope of rearing him. From nine years of age to twelve, he was under the tuition of Dr. Woodeson at Kingston-upon-Thames. Here he acquired the elements of classical learning, and he mentions his twelfth year as particularly "propitious to the growth of his intellectual stature," because at this period he read a variety of English books of poetry, romance, history and travels. "He then went to Westminster school, but his ill state of health prevented him from making a regular progress in the studies of the place. For several years he was chiefly the object of medical care, till at length, and, as it were, very suddenly, his constitution acquired firmness, and his father immediately sent him, as gentleman-commoner, to Magdalen college, Oxford. He was probably ill prepared to receive the benefits of an university education, and he stigmatises the fourteen months that he spent there as the most idle and unprofitable of his whole life. To a total neglect of religious instruction he has attributed a very remarkable incident which took place at this time. He had from an early age been addicted to disputation on topics of divinity. His leisure from other pursuits induced him to turn his attention to the controversies between the Papists and Protestants. His mind was overlet by the arguments of the former, and in 1753 he had an interview with a popish priest in London, when he solemnly abjured the errors of Protestantism. He immediately wrote an elaborate letter to his father, in which he avowed the change in his sentiments, and justified the measure which he had taken. With all the zeal of a new convert he has since declared, "I am proud of an honest sacrifice of interest to conscience: I can never blush if my tender mind was entangled in the sophistry that seduced the acute and manly understandings of Chillingworth and

Bayle." He was sent by his father to Lausanne, and placed with a Calvinist minister, by whose judicious efforts, aided by his own sound reason and mature reflections, his faith in the Romish articles gradually gave way, and on Christmas day 1754, he received the sacrament in the Protestant church. During the time he spent at Lausanne, he laid the foundation of that knowledge in the languages, and in the art of logic, which enabled him to make so conspicuous a figure in the literary world. To the "History of the Decline and Fall of the Roman empire," we have had occasion frequently to recur for an elucidation of facts, we may therefore be allowed to speak somewhat at large of the author of that work. His ruling passion, that of reading, completely developed itself in Switzerland, and he wanted no excitements to industry, from a tutor. Belles lettres, and the history of man, and the human mind, were his favourite objects of study; for the mathematics he had no inclination, and what he did not, and perhaps could not pursue, he was ready to condemn, and congratulated himself that he escaped from them: "before his mind was hardened by the habit of rigid demonstration, so destructive of the finer feelings of moral evidence." That this view of the effect of mathematical studies was unjust, might be proved from a variety of instances in which the ablest mathematicians have been equally celebrated for their fine taste and excellent judgment in other branches of literature. In the year 1758 he returned from Lausanne to London, where he was kindly received by his father, and he found in a mother-in-law, a new relative, who in time conciliated his good will and confidence. He now began laying the foundation of a copious library, and soon set about preparations for appearing before the public as an author. In 1761, he printed his "Essai sur l'Etude de la Littérature," in one volume 12mo. It was a very respectable juvenile performance, and was highly praised in the foreign journals. At home it obtained but a small share of public notice. While he was composing this work, at least before it was published, he was engaged in the military profession, which was but ill calculated for a person of his turn. The peace, in 1763, set him free from a commission which he had held in the militia, and he immediately paid a visit to Paris, and having spent some months in that capital, he went to Lausanne, where he passed a year in cultivating society, and in collecting materials for a profitable journey into Italy. This he undertook in 1765, and it was, as he sat musing amidst the ruins of the capitol, while the friars were singing vespers in the temple of Jupiter, that the idea of writing his great work, *viz.* "The History of the Decline and Fall of this City," rushed into his mind. He had, previously to this, proceeded some way in another interesting design, and composed, in the French language, the first book of a History of the Swiss liberty; but this, perhaps on account of its style, was condemned by a literary society of foreigners in London, to whom it was read, and he committed it to the flames. In 1767, he assidued in compiling a critical work, entitled "Memoires Litteraires de la Grande Bretagne," the success of which was but trifling. In 1770 he published, in his native tongue, a pamphlet, entitled "Critical Observations on the sixth book of the Æneid," which was intended as a refutation of Dr. Warburton's hypothesis concerning the meaning of the descent of Æneas: and in the same year, by the death of his father, he succeeded to an estate considerably involved, and from the perplexities of which he scarcely ever extricated himself. His circumstances were, however, well suited to the task he had undertaken as an author: for he thought himself, that had he been either much poorer or much richer, he should never have accomplished it. Leisure and books were necessary on

the one hand; on the other, the stimulus of a handsome increase of property. His acquaintance was large, but he compensated the hours devoted to them by early rising and close application. In 1774, he was, through the interest of Mr. Eliot, introduced to a seat in parliament, which he occupied during eight years, and gave, says he, many a silent vote in support of the rights, though not, perhaps, the interest of the mother country. Early in 1776 the first volume of his "History" made its appearance; its success was very great, and far surpassed the most sanguine expectations of the author: "The first impression," says he, "was exhausted in a few days; a second and a third edition were scarcely adequate to the demand, and the bookseller's property was twice invaded by the pirates of Dublin." It was received with general applause, but the praises of none were so keenly relished by Gibbon, as those of the two celebrated historians, Hume and Robertson, who, instead of viewing his rising fame with jealousy, promoted it with liberal commendation. In the midst of his triumph, his two chapters, concerning the growth and progress of Christianity, raised a storm against him, which, as he had not foreseen, he regarded with some alarm. He was attacked on all sides, but as he professed to have written only as a historian, he declined entering the lists as a controversialist. In one instance his fidelity, as an historian, was attacked; here he felt that he was called on for a "Vindication," in which it was admitted that he successfully repelled the principal charges, and returned them on his antagonist. It was suggested, in the two chapters referred to, that the progress of Christianity was peculiarly favoured by secondary causes, and of course that its origin was not divine: though this theory had not been delirious of advocates among sincere believers in the truth of the Christian system, yet there is little doubt that Gibbon was an unbeliever, and he wrote in this part of his work under the mask of a friend. His pretensions were unveiled by many excellent writers, who ranked high in the established church, and by others who were not in the church, but who were equally alive to the spread of sceptical principles, and active in opposing their propagation. After he had resumed his work, he was solicited by ministers to write an answer to the manifesto of the court of France, on its declaration of hostilities. On this occasion he published his "Memoire Justificatif;" it was written in French, and much admired for its style and its reasoning, and was delivered, as a state paper, to the courts of Europe. For this service he was rewarded with the appointment of one of the Lords of Trade, by which a handsome addition was made to his income, and little to his engagements. In 1781 the second and third volumes of his History appeared, which supported the reputation which he had already acquired. Upon the dissolution of lord North's ministry, the board of Trade was abolished, as occasioning only an useless expence to the state. The defalcation in Mr. Gibbon's income no longer permitted him to support the same style of living in his own country, and he removed his residence to Lausanne: here, in an elegant retreat, he finished his History, in three other quarto volumes, which were published in 1788. It was with real regret that he dismissed an occupation, which had given to many years of his life that zeal which an interesting object of pursuit can alone impart. He came to England to superintend the printing of his work, and then returned to Lausanne, to spend, as he hoped, the remainder of his days; but the storms of the French revolution, which menaced the quiet and happy regions of Switzerland, gradually loosened his attachment to Lausanne, and he began to look towards England for a refuge. He regarded the events that were

taking place in France with the utmost abhorrence, and he either was, from habit, or had become so from the occurrence of the times, a decided enemy to every species of public reform. He showed his assent to Mr. Burke's creed, which he had vindicated in his "Reflections;" "I admire," says he, "his eloquence, I approve his politics, I adore his civility, and I can almost excuse his reverence for church establishments." Mr. Gibbon returned to England in 1793, but after a few months residence his attention was forcibly called to the progress of a disease, which had subsisted in a small degree for thirty years, and which now terminated his existence, Jan. 16, 1794. He has characterized himself in the following words: "I am endowed with a cheerful temper, a moderate sensibility, and a natural disposition to repose rather than activity; some mischievous appetites and habits have, perhaps, been corrected by philosophy or time. The love of study supplies each day, each hour, with a perpetual source of independent and rational pleasure." "He was," says his biographer, "easy in society, and fond of it; he was beloved by his friends, and had, in an eminent degree, the manners and habits of a gentleman. Early indulgence and habit had made the conveniences and elegances of cultured life essential to his comfort, and he was not one who could have been content with the conscientiousness of mental superiority in an humble state. His great work, which will long be a monument to his fame, is a performance of vast and accurate research, and of enlarged and philosophical thinking: it abounds in splendid passages, and its style displays a thorough mastery of the whole compass of the English language." After his death two quarto volumes of his miscellaneous works were published by lord Sheffield, containing, among other things, memoirs of his life and writings, composed by himself; to which the reader is referred for more particulars relating to this celebrated man.

GIBBONS, ORLANDO, without exception, the best composer for the church during the reign of king James I. and though not blest with longevity, yet, during his short life, he contributed amply to the music of the church, which he enriched with numerous compositions, that are still fresh and in constant use among the best productions within its pale.

This excellent musician, a native of Cambridge, was brother of Edward Gibbons, bachelor of Music, organist of Bristol, gentleman of the Chapel Royal, and master of Mathew Lock; and of Ellis Gibbons, author of two madrigals in "the Triumphs of Oriana," who is cited by Ant. Wood, "the admirable organist of Salisbury." In 1604, at the age of twenty-one, Orlando was appointed organist of the Chapel Royal, in the room of Arthur Cocks. In 1622, he was honoured at Oxford with a doctor's degree in music, at the same time as his friend Dr. Heyther, when both were countenanced and favoured with indulgencies in the university in consequence of letters from the learned Camden, who recommended them with friendly zeal to its notice. According to Ant. Wood, the recital exercise in six or more parts, performed at this time for Heyther's degree, was composed by Orlando Gibbons, "as one or more eminent musicians then living had several times told him." So that *großen-gemüthen*, as well as boys, through idleness or ignorance, are sometimes reduced to the humiliating necessity of having recourse to the charity of friends, before they can exhibit an exercise.

A manuscript copy of the exercise performed for Dr. Heyther's degree, is said to have been found, signed with the name of Orlando Gibbons. It is an anthem for eight voices, taken from the forty-seventh psalm; and appears to be the very same composition as the anthem of Orlando

Gibbons, to the words "O clap your hands together all ye people." Printed in Boyce's Cath. Mus. vol. ii. p. 59.

The harmony in Gibbons's service in F, printed by Dr. Boyce, is pure, clear, and grateful; and the melody more accented and flowing than we have found in any choral music of equal antiquity.

The two parts in one, of the *Gloria Patri*, though they may be the cause of some confusion in the words, discover no restraint or stiffness in the melody, which continues to move with the same freedom, as if no *canon* had existence. And though the *purists*, on account of the confusion arising from all the parts singing different words at the same time, pronounce the style, in which his full anthems are composed, to be vicious; yet the lovers of fugue, ingenious contrivance, and rich, simple, and pleasing harmony, must regard them as admirable productions, *alla Palestrina*, a style in which Tallis and Bird acquired so much renown.

Besides his admirable choral compositions, O. Gibbons was author of melodies in two parts to the hymns and spiritual songs of the church, translated by George Withers, and of several other works which are mentioned elsewhere. See FANTASIA and PARTHENA.

Dr. Tudway, in the dedication of the first volume of his manuscript "Collection of the most celebrated Services and Anthems used in the Church of England," addressed to Lord Harley, for whom it was made; after a just and warm eulogium on the abilities of Tallis and Bird, says that "none of the later composers could ever make appear so exalted a faculty in compositions for the church, except that most excellent artist, Orlando Gibbons, organist and servant to king Charles I. whose whole service, with several anthems, are the most perfect pieces of church compositions which have appeared since the time of Tallis and Bird; the air so solemn, the fugues and other embellishments so just and naturally taken, as must warm the heart of any one, who is endued with a soul fitted for divine raptures." To this encomium every candid judge of harmony will readily subscribe; but when the doctor tells us, that the celebrated service in F was composed by Orlando Gibbons in 1635, he furnishes no very favourable proof of his knowledge in chronology; as it is recorded on the monument erected to his memory by his widow, that he died ten years before that period. For in 1625, being commanded, *ex officio*, to attend the solemnity of the marriage of his royal master, Charles I. with the princess Henrietta of France, at Canterbury, for which occasion he had composed the music, he was seized with the small-pox, and dying on Whitfriday, in the same year, was buried in that cathedral.

GIBBONS, Dr. CHRISTOPHER, was the son of Orlando Gibbons, and scholar of his uncle Ellis Gibbons, organist of Bristol. He had been honoured with the notice of Charles I. and was of his chapel. At the restoration, besides being appointed principal organist of the Chapel Royal, private organist to his majesty, and organist of Westminster Abbey, he obtained his doctor's degree in music at Oxford, in consequence of a letter written by his majesty Charles II. himself, in his behalf, which is inserted by Ant. Wood in the Falli Oxon, vol. ii. Col. 158; who says, that he completed his degree in an act celebrated in St. Mary's church, July 11, 1664.

The compositions of this master, which were not numerous, seem never to have enjoyed a great degree of favour; and though some of them are preserved in the Museum collection, they have long ceased to be performed in our cathedrals. His abilities on the organ, however, must

have been considerable, to entitle him to the stations he filled, at a time when the style of playing that instrument was so much more complicated and elaborate than at present. Dr. Blow, who, in singing and composition, was educated by Captain Cook, is said to have been a scholar on the organ of Dr. Christopher Gibbons, who died 1676.

Orlando Gibbons had two brothers, Edward and Ellis, the one organist of Bristol, and the other of Salisbury. Edward was a Cambridge bachelor of music, and incorporated at Oxford, 1592. Besides being organist of Bristol, he was priest-vicar, sub-chorister, and master of the choiristers in that cathedral. He was sworn a gentleman of the chapel, March 21, 1624, and was the master of Matthew Lock. In the Triumphs of Oriana, there are two madrigals, the one in five, and the other in six parts, composed by Ellis Gibbons. Wood styles him the admired organist of Salisbury. Of Edward Gibbons, it is said, that in the time of the rebellion he assisted king Charles I. with the sum of one thousand pounds; for which instance of his loyalty, he was afterwards very severely treated by those in power, who deprived him of a considerable estate, and thrust him and three grand children out of his house, though he was more than fourscore years of age.

GIBBOSITY, in *Surgery*. See SPINE, *Curvature of*.

GIBBOUS, in *Astronomy*, is used in reference to the enlightened parts of the moon, while she is moving from full to the first quarter, and from the last quarter to full again; for all that time the dark part appears horned, or fal-cated, and the light one bunched out, convex, or gib-bous.

GIBBOUS fish, *gibbosus piscis*, in *Ichthyology*, a name given by Mr. Ray to the fish called by the Dutch *kromrugb*. It is a smooth fish without scales, its belly is white, its fins and tail black. It grows to a considerable size, sometimes to four feet. It is caught all over the East Indies, near the sea shores, and is very firm, and much esteemed at table. It has its name from the remarkable rising of its back, which is like that of the perch, but much higher. Ray's Ichthyology Append. p. 4

GIBBY, in *Geography*, a cluster of small islands, in the East Indian sea, about twelve leagues in circumference, well inhabited, situated on the equator. E. long. 126° 5'.

GIBE, a town of Arabia, in the province of Nedsjed; 130 miles E. N. E. of Hajar.

GIBEAH, in *Scripture Geography*, a city of Benjamin, the birth-place of Saul, the first king of Israel. (Josh. xviii. 24. Ezra ii. 26. Nehem. vii. 30.) Gibeah was about two leagues N. from Jerusalem. In Jerome's time it was entirely destroyed.

GIBEL-EL-TOR, a mountain of Palestine, anciently called *Mount Tabor*, which see.

GIBELET, or GABYLE, a sea-port of Syria, anciently called "Gabala" and "Gabalon," situated on the coast of the Mediterranean, at the mouth of the river Jebike; 12 miles S. S. W. of Tripoli.

GIBELIN, a town of Palestine; eight miles E. of Gaza.

GIBELINS, GIBELLINS, *Gibellings*, or *Ghibelins*, a famous faction in Italy, opposite to another called the Guelphs.

The Guelphs and Gibelins ravaged and laid waste Italy for a long series of years: so that the history of that country, for the space of three centuries, is only a detail of their mutual violences and mortal wars.

The Guelphs strenuously asserted the power of the see of Rome, as the Gibelins did the emperor's right of sovereignty.



We have but a very obscure account of their origin, and the reason of their names: the generality of authors affirm, that they arose about the year 1240, upon the emperor Frederic the III's being excommunicated by pope Gregory IX.

That prince, say they, making a tour among the cities of Italy, gave the name Gibelins to such as he found well affected to him; and that of Guelphs to those who adhered to the pope. But as to the reason and signification of these words, there is a deep silence; Gibelin might be possibly formed of *gebieten*, *imperator*; whence *gebietend*, *imperiosus*. Of *gebieten*, the Italians might make, by corruption, Gibelin; so that Gibelins, in this light, should be the same with Imperiales, or such as followed the emperor's party.

By the way, some writers maintain, that the two factions arose ten years before; though still under the same pope and emperor.

Other historians relate, that Conrad III. marching into Italy, in the year 1139, against the Neapolitans, Roger, count of Naples and Sicily, in order to defend his states, called to his assistance Guelph duke of Bavaria; and that one day, when the two armies were ready to join in battle, the Bavarians cried out in High Dutch, *hie, Guelph!* or, as others say, in Flemish, *hier, Guelph!* that is, *here, Guelph!* and that the Imperialists answered on their side, with the words *hie, or hier, Gibelin!* *here, Gibelin!* calling the emperor by the name of the place where he had been bred.

Hornius refers the names to the war in 1140, between Henry the Proud, duke of Bavaria and Saxony, and Conrad III. duke of Suabia; the two princes preparing to engage near the town of Winsberg, the Bavarians began to cry out Guelph, which was the name of duke Henry's brother; and the partisans of the emperor Weibelingen, which was the name of the place where that prince was born and bred, in the duchy of Wirtemberg, whose surname he bore: from which Weibelingen the Italians at length formed Gibelin.

This account is confirmed by Martin Crusius: "Initium Gibelinæ (Wibelinæ à patria Conradi regis) et Wellicæ concertationis." Conrad being of Weibelingen, that word, says Crusius, gave rise to *gibellingue*, and that to *gibelling*, *Gibelins*, *Gibelini*.

Platina, on the other hand, assures us, that the name Gibelins arose from that of a German at Pistoia; whose brother, named Guelph, gave likewise his name to the opposite faction: the two brethren, it seems, bearing an irreconcilable hatred. Others maintain, that the emperor gave the appellation Gibelins to those of his party, from the German word *gipffe*, signifying *ridge*, or *top*; because the empire rested on them, as the rafters of a house lean on the ridge, which joins them a-top.

Karus, a learned canon of Straßbourg, in the lives of the emperors of the house of Brunswick, is of the second opinion above related: in a battle, says he, between Welf, or Guelph, and Frederic, the army of the first crying out, *hie, Welf, hie, Welf!* the second commanded his to cry out *hie, Gibeling! hie, Gibeling!* the name of his birth-place: and the French and Lombards asking the signification of those words, they were answered, that by *Welf* was meant the pope's party; and, by *Gibelin*, the emperor's.

Yet others contend, that the word Gibelin is only a softening of the word *gibertin*, or *guibertin*; and that it arose from Guibert, an antipope, set up by the emperor Henry III. in the year 1080.

Among many other conjectures, Maimbourg, in his Hist. de la Decad. de l'Emp. advances another opinion, Vol. XVI.

that the two factions, and their names, arose from a quarrel between two very ancient and illustrious houses on the confines of Germany, that of the Henrys of Gibeling, and that of the Guelphs of Adorf. See Machiavel.

It is said by some, that the Gibelins, when driven out of Italy long after the year 1229, at which period the contest between them and the Guelphs ran very high, and settled at Amsterdam, were the inventors of the mercantile practice of re-change, or re-exchange, on bills of exchange, on account of the damages and charges they were put to, and the interest of the money of their bills protested, which had been given to them for the effect: they had been obliged to leave behind them. Anderson's Hist. Commerce, vol. i. p. 110. See GUELPHS.

GIBELLO, in *Geography*, a town of the duchy of Parma, on the right bank of the Po: 16 miles N.W. of Parma. N. lat. 45 1'. E. long. 10° 7'.

GIBEON, in *Scripture Geography*, the capital city of the Gibeonites, who availed themselves of the oaths of Joshua, and of the elders of Israel, on an artful representation which they made of their belonging to a remote country. (Josh. ix.) Joshua and the elders made an unadvised league with them; but upon a discovery of their mistake, they spared their lives, and condemned them to the servile office of carrying wood and water to the tabernacle, and other work of a similar kind, in token of their pusillanimity and duplicity, as slaves and captives. In this state of servitude they remained till the entire dispersion of the Jewish nation, A. M. 2553. The Gibeonites were descended from the Hivites, the old inhabitants of the country, and possessed four cities, *viz.* Cephira, Beeroth, Kirjath-jearim, and Gibeon, the capital, afterwards given to Benjamin, excepting Kirjath-jearim, which was assigned to Judah. The Gibeonites submitted to the burthens imposed upon them by Joshua, and continued faithful to the Israelites. Nevertheless Saul destroyed a very great number of them (2 Sam. xxi. 1, 2, 3, &c.); but God, as a punishment of his cruelty, in the reign of David, caused a great famine, which lasted three years (A. M. 2983. B. C. 1017); and David was informed by the prophets, that this calamity would continue as long as that cruelty, which Saul had exercised against the Gibeonites, remained unretaliated. The Gibeonites, being asked what satisfaction they required, answered, "Seven of Saul's sons will we put to death, to avenge the blood of our brethren." Accordingly the Gibeonites crucified them in the beginning of spring, when, in Palestine, the barley-harvest commenced. From this time we find no mention of the Gibeonites, as forming a separate people. But they were probably included among the "Nethinim," who were public slaves appointed for the service of the temple. (1 Chron. ix. 2.)

Gibeon was seated on an eminence, as appears by its name, denoting a hill; it was 40 furlongs N. from Jerusalem, according to Josephus. It is called "Gabaon" (see 2 Sam. v. 25, compared with 1 Chron. xiv. 16.) We find mention of the fountain and pool of Gibeon. (2 Sam. ii. 13.) The tabernacle and altar of burnt offerings, made by Moses in the wilderness, were removed to Gibeon. (1 Chron. xvi. 29, 30.) When Solomon was seated on the throne, he went to sacrifice at Gibeon, because this was the most considerable of all the high places where sacrifices were then tolerated, the temple not being yet built. (1 Kings, iii. 4.)

GIBERT, BALTHAZAR, in *Biography*, was born at Aix in 1662. He was educated partly at Paris and partly at Soissons. At the age of twenty-two he was appointed to teach philosophy at the college of Beauvais, and in 1688 he obtained

obtained the professorship of rhetoric in the college of Mazarin at Paris, which office he filled with great reputation more than fifty years. He was a zealous defender of the privileges of the university, of which he was several times chosen rector. He obtained other preferments connected with the university, but on account of his opposition to the revocation of an appeal made by the university against the bull *Unigenitus*, the court, in 1740, exiled him to Auxerre. He died in the following year at the age of seventy-nine. He was author of many works, in which are displayed much erudition and solidity of judgment, but the style is somewhat involved. Among his publications are "De la véritable Eloquence;" "Reflexions sur la Rhetorique;" "Jugemens des Savans sur les Auteurs qui ont traité de la Rhetorique;" in three volumes 12mo. Moreri.

GIBERTI, GIAMMATEO, a very learned prelate of the church of Rome, was born at Palermo towards the close of the sixteenth century. He visited Rome when he was but twelve years of age, where he was distinguished for the brilliancy of his talents, and was introduced to pope Leo X. who entertained a great regard for him. He had a thirst for polite literature, but was, at an early age, taken from the pursuit, and placed in the service of a person of high rank. By pope Clement VII. he was employed in some very important legations to the king of France and other potentates. In 1523 he obtained from his patron the government of Tivoli, and in the following year he was created bishop of Verona; he was not, however, allowed to take possession of his see, but was kept at Rome as the adviser and friend of the pope. In 1527 Giberti was given as one of the hostages by the pope to the Imperial army, on which occasion he underwent much ill treatment, and was more than once threatened with a shameful death. He was, at length, through the interposition of his friend, Cardinal Pompeo Colonna, restored to his liberty, and retired to his bishopric, on which he continued to reside till his death, except when occasionally summoned to Rome by Paul III. He died in 1543, and his works, which were numerous, have been published collectively; they chiefly consist of his constitutions and regulations for the government of his church, which under his direction became a model of ecclesiastical discipline. He eradicated many abuses, and was profuse in alms to the poor. He was the patron of learned men who resorted to his palace, among whom was the celebrated poet Flaminio. He printed at his own expence, and under his own eye, several works of the fathers, and in order to render his editions correct, he entertained several Greek copyists. Moreri.

GIBET, or GIBBET, a machine in manner of a gallows whereon notorious criminals, after execution, are hung in irons, or chains: as spectacles, in terrorem.

The word in French, *gibet*, properly denotes what we call *gallows*: it is supposed to come originally from the Arabic *gibel*, *mount*, *elevation of ground*; by reason gibets are usually placed on hills, or eminences.

GIBLETS, the offals or entrails of a goose; including the heart and liver, with the feet, gizzard, &c.

The word is supposed to be formed of *goblets*, from the French *gobeau*, *mouthful*.

Giblets make a considerable article in cookery: they boil giblets, stew giblets, make ragouts of giblets, giblet-pies, &c.

GIBLIEN, in *Geography*, a town of Egypt, on the left bank of the Nile; 14 miles N. of Asna.

GIBLOS, a city on the coast of Phœnicia, between Tripoli and Berytus; called also *Byblos*, which see.

GIBON, a town of the island of Cuba; 22 miles N.N.E. of Bayamo.

GIBRALÉON, a town of Spain, in the province of Seville, on the river Odiel, with a harbour for small fishing vessels; containing about 150 houses in two parishes, and situated about 10 miles from the Atlantic; 44 miles W. of Seville. N. lat. 37° 20'. W. long. 7° 1'.

GIBRALTAR, derived from *Gebel*, an arabic word signifying mountain, and *Tarik*, the name of a Moorish general, who conquered Spain and disembarked here in the year 712, is a town of Spain, in the province of Andalusia, but belonging to Great Britain, situated on a rock, at the southern extremity of Europe, and reckoned one of the keys of Spain. This rock forms a promontory from Spain into the sea, opposite another promontory extending from Africa, bounding a narrow sea, which unites the Atlantic with the Mediterranean, called in Latin "Fretum Herculeanum, or Gaditanæum," and in English the *Straits of Gibraltar*. The length is about eight leagues, and the breadth, in the narrowest parts, nearly five. On these two promontories are placed the famous mountains of Calpe in Europe, and Abila in Africa, known to the ancients by the name of the pillars of Hercules. From the top of the promontory of Calpe, the eye commands an extent of 40 leagues, two seas, and five kingdoms, *viz.* Seville and Granada, in Spain, and Barbary, Fez, and Morocco, in Africa. In endeavouring to trace the town mentioned by Mela, Strabo, and Pliny, under the names of Calpe, Cartheya, Melaria, Belo, and Belipo, and also the promontory of Juno, situated from east to west on the shore of the straits, no vestige is perceived, except the mountain and scite of Cartheya; which latter city passed from the possession of the Phœnicians to that of the Carthaginians, and is now reduced to a mere heap of ruins, scarcely discernible in the bay of Gibraltar, where the Carthaginian tower was also situated. This ground is now occupied by a mean farm. On casting your eyes over the kingdoms of Granada and Seville, you see the lofty ridges of the desert del Cuervo, as well as the mountains of Hogen and Sanorra, and towards the east, opposite to Gibraltar, the new town of Algeziras. In the middle of this inclosure you distinguish the ruins of Great Cartheya; at a short distance, on a little hill, the town of St. Roche is situated; on the east you perceive the chain of mountains, called the Sierra de Ronda, abounding in fruits and aromatic plants. Near these stood the town of Munda, so celebrated in Roman history as the scene of the battle between the sons of Pompey and Augustus, when they were disputing the empire of the world. The objects which bound the horizon on the right are the Sierra Nevada, and the Alpujarras; on which the snow lies all the year. The mountains supply a number of fountains and rivulets of clear water, forming the sources of the Xenil and the Darro; rivers which water the city of Granada and give fertility to the rich province of Andalusia.

The promontory on the European side is joined to Spain by an isthmus, or neck of land, so narrow, that from some aspects the rock has the appearance of an island. The length of the isthmus is about 200 paces; across which the Spaniards have drawn a line and fortified it, to prevent the garrison from having any communication with the country.

The form of the rocky mountain, on which the fortress of Gibraltar is built, is oblong; its summit is a sharp craggy ridge, extending nearly from N. to S., almost three miles, and in breadth no where exceeding  $\frac{3}{4}$  of a mile. The line of its ridge is undulated, and the two extremes are somewhat higher than the centre. The summit of the Sugar-loaf, which is the highest point towards the south, is elevated

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rated to the height of 1439 feet; the Rock-mountain, which is the highest eminence to the north, is 1350 feet; and the Signal-house, which is nearly the central point between these two, is 1276 feet above the level of the sea. The western side of the mountain forms a series of rugged slopes, interspersed with abrupt precipices. Its northern extremity is perfectly perpendicular, except towards the N. W., where what are called the Lines intervene, and a narrow passage of ground that leads to the isthmus, and is entirely covered with fortification. The eastern side of the mountain mostly consists of a range of precipices; but a bank of sand, rising from the Mediterranean in a rapid acclivity, covers a third of its perpendicular height. Its southern extremity falls in a rapid slope from the summit of the Sugar-loaf into a rocky flat of considerable extent, called Windmill Hill. The principal mass of the mountain rock consists of a grey, dense marble: the different beds of which present to Spain a face of 1350 feet of perpendicular height, in a conical form. These beds, or strata, are of various thicknesses, from 20 to upwards of 40 feet, dipping in a direction from east to west, nearly at an angle of 35 degrees. In some parts of the solid mass of this rock, we find testaceous bodies entirely transfigured into the constituent matter of the rock, and their interior hollows filled up with calcareous spar; but these do not occur often in its composition, and its beds are not separated by any intermediate strata. This rock is suffering a slow, but constant deposition; and the uncovered parts of it present holes of various sizes, hollowed out of the solid rock, and apparently formed by the attrition of gravel or pebble, set in motion by the rapidity of rivers or currents in the sea; whence it is presumed, that, however high the surface of this rock may now be elevated above the level of the sea, it has once been the bed of agitated waters. On the west side of the mountain, towards its base, strata occur, which are of a different kind from the mountain rock. (See Major Imrie's mineralogical Description of Gibraltar in the Transactions of the Royal Society of Edinburgh, vol. iv.)

The first, or highest, forms the segment of a circle, its convex side being towards the mountain, and its slope being in that direction. This stratum consists of a number of thin beds; the outward one, which is the thinnest, is in a state of decomposition, and is mouldering down into a blackish-brown or ferruginous coloured earth. The beds below this increase progressively in breadth to 17 inches, where the stratification rests upon a rock of an argillaceous nature. This last bed, which is 17 inches thick, consists of quartz of a blackish-blue colour, in the septa or cracks of which are found quartz crystals, colourless and perfectly transparent. These crystals are composed of 18 planes, disposed in hexangular columns, terminated at both extremities by hexangular pyramids. The largest seen by major Imrie, did not exceed one-fourth of an inch in length; they generally adhere to the rock by the sides of the column, but are detached without difficulty. Their great degree of transparency has obtained for them the name of "Gibraltar diamonds." The rock is completely beset with batteries, thrown up at all points, where the ascent could not be rendered completely inaccessible; so that from Europa Point, which advances farthest into the sea on the south side, to the highest part of the rock, which is that of the north (at about two miles distance from the other), there is not a single point, which is not put into a defensible condition. On the side nearest Spain, the internal fortifications, made since the time Gibraltar was besieged by the combined armies of France and Spain, are astonishing. These improvements are principally owing to general O'Hara, the

late governor; a great number of workmen having been employed about it, for eight years, at an immense expence. In order to form some idea of the labour expended on these fortifications, it will be sufficient to observe, that the excavations effected by the force of gun-powder, in the centre of the mountain, and in the solid rock, form vaults of such height and extent, that during a siege they are capable of containing the whole garrison. These caverns, of which the most considerable is the hall of St. George, communicate with the other batteries, established along the mountain by a winding road, passable on horse-back. On returning towards Europa Point, as you enter the town, your attention is engaged by considerable fortifications, barracks, magazines, and batteries, placed wherever the nature of the ground would admit. On the highest point of land the tower of St. George was built, under the directions of general O'Hara, who intended to raise it to a sufficient height for commanding the whole of Cadiz, and observing all that passed in that port; but the undertaking, being disapproved by the British government, was left in an unfinished state. Along the mountain are several grottos, or natural excavations, the most famous of which is that of St. Michael; the height of the entrance being 437½ (varas) yards above the level of the sea. The cavern below is at least 70 feet, and contains columns of crystallization and stalactites, resembling all the orders of architecture. About 100 paces from its gate is another beautiful cavern, 65 varas square, and the vault 21 varas high. On the right is a second excavation, adorned with caprices of nature similar to those of the former, but so regularly disposed, that it has the appearance of a temple. Perhaps this was formerly used for consulting some oracle, probably that of Hercules, who was the principal divinity of the place, as well as of the cave in the promontory of Ampelusia, on the coast of Africa. From the entry of this cavern you discover the whole of the bay of Gibraltar, two leagues across from east to west, and three from north to south. You also command a view of the country-houses, the flower and kitchen gardens, which the inhabitants have formed one above the other, on the side of the mountain, up to the royal road, and the public walk, extending for about half a mile from the town of Gibraltar to the new town on the south. The English have spared no pains in covering the rock with trees and flowers, in supporting the earth with walls and parapets, in cutting a number of roads through the solid rock, and in making them passable on horse-back and in carriages up to the very summit. They have even some artificial meadows for their flocks. From the grotto of St. Michael, situated on the southern part of the mountain, at an almost equal distance, the Signal tower and the Sugar loaf, the entrance of which is 5000 feet above the level of the sea, you discover the magazines, the batteries, the new town; on the south, the marine hospital, which is a handsome and convenient building. The view extends over a number of country-houses, to some of which beautiful gardens are attached: in time these new buildings will form a town as considerable as that of Gibraltar. Near these are eight magnificent cisterns, large enough to contain 20,000 tons of water, and bomb-proof; they receive all the water which flows down the side of the mountain, previously purified in coppers erected for the purpose. On the south side you perceive a number of mountains, called Tarfés; and near them formerly stood a very ancient tower, with a cistern and well. In a cave not far distant several bones have been found with human bones above the common size, so strongly incrustated in them as to form one solid mass. (See *Field's BOOKS*.) From Europa Point to the gate on the land-side

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are several moles, which facilitate the unloading of ships, and enable them to cast anchor in security. Before you arrive at the fourth gate you observe a handsome, large, square, surrounded with trees, now called the Field of Mars, formerly the Red Sand; of such a size, that the 6000 men, usually composing the garrison, can perform their manœuvres without inconvenience. Here the guard always musters, and on Sundays and holidays they make it the grand parade.

The prevailing forms of religion in this promontory are the Catholic, that of the church of England, and the Jewish, each of which has its own burying ground, among the sandy earth of the mountain.

The town of Gibraltar is on the west side at the foot of the mountain; it is large, well built, fortified with strong walls, bastions, and works to cover them; a large fort protects and marks the mole, built in the form of a bridge, 300 feet long; a church is built near it; and on the land side is another mole, which covers the part fortified by a fort with a tower, and two or three breast-works, thrown up in front. On entering the town by the fourth gate, you perceive on the left an edifice, containing the library of the officers of the garrison; consisting chiefly of the works of modern authors. The governor's house is built on the ground formerly occupied by the convent of Franciscans; to which is attached a beautiful garden, which, on Thursday and Sunday evenings, during the summer, is the promenade of the officers of the garrison and inhabitants of the city. The principal street into which you enter on leaving the governor's house, is the residence of the merchants, and on the right is the Catholic chapel, rebuilt in an excellent style of architecture; this street extends almost through the whole length of the city, being more than half a mile long, and on each side it has handsome flat pavements, and a number of shops from one end to the other. All the houses are built in the English style, with small doors, flat roofs, and enormous bow windows, behind which the prime goods of all sorts are exposed to sale. The inhabitants are chiefly military; the commerce with Africa is neither certain nor regular; and although the contraband trade with Spain, both in money and goods, is one of the principal branches of trade, that cannot be sufficient (says La Borde) to indemnify England for a million and a half of piastres, which on an average it costs annually to maintain this point in the Mediterranean, where in other respects the duties collected are very small. This place is advantageously situated for victualling the fleets, and the protection of the coast of Africa, from whence the English procure their corn, and as a place of refuge for their privateers and sloops of war. The port is a key to the Mediterranean and to the Atlantic; consuls from all the states of Europe and North America usually reside there. The Americans, as well as the Swedes, Danes, and Dutch, in time of peace, carry on a direct commerce with Gibraltar, by supplying themselves with the articles they want, and leaving in exchange snuff, cod, pitch, and tar, masts, rum, maize, rice, flour, sugar, pepper, ginger, cotton, aniseed, and the other articles of commerce, which they procure from Asia, Africa, and Europe. The coats of Granada, Seville, and Catalonia, furnish wine, and Africa wax and fresh meat in great quantities; they also import from Spain brandy, raisins, almonds, oranges, lemons, hicks, salt, &c. which the vessels from the north carry back in exchange. Gibraltar contains altogether 9000 inhabitants, including eight regiments, amounting to 6000 men; so that this place is rather a military colony than a commercial establishment. The population of Gibraltar extends one mile to the south, and nearly as much towards the top of the mountain; and if we may judge from the new buildings

lately erected, it is certainly increasing. All the houses are painted black on the outside, with white borders or ledges, shewing the number of stories, which are generally two or three. This mode is well suited to a country where the reflection of the sun is so violent. The police is well conducted; no beggars are to be found here; the streets are preserved clean and salubrious; and though they are all well lighted at night, no one is allowed to walk without a lantern, and a permission from the general; sentinels requiring answers to their challenges being stationed in the town, as well as patrols and watchmen. All forms of religion are tolerated without inconvenience, and the number of Jews, who live here more securely than in any other part of Europe, is very considerable. Gibraltar has a theatre, which, though small, is well laid out and adorned with taste. For want of regular actors, the officers of the garrison perform, during the greater part of the year, a number of English plays.

On the opposite side of the straits of Gibraltar is the town of Ceuta. The traveller, who wishes to cross over into Africa, may take advantage of the N.W. winds, and of the small vessels which are continually passing and repassing.

The origin and foundation of this town are lost in the obscurity of time. It is certain, however, that the Phœnicians, the Egyptians, and other ancient people, landed at Gibraltar; and the name of the pillars of Hercules, by which this place was known, is nothing more than a tradition preserved among the Phœnicians, who peopled this coast, and brought their gods and religious worship with them. But it is not known whether the straits or columns existed in the remotest antiquity, and if the inscription "non plus ultra" meant that nothing was more wonderful than the separation of the two continents, or, as is more probable, that no one had dared to navigate beyond this point. However this be, it is probable that the first navigators of the Mediterranean landed at Gibraltar, or its environs. This opinion is supported by the authority of Pomponius Mela, who, being born at Cadiz, may be supposed to feel more interest than others in whatever related to this coast. The Moors seized on Gibraltar in the eighth century, and held it without interruption till the fourteenth, when, in the year 1310, it was taken from them by Perez de Guzman; but they retook it in the year 1332, and held it till the year 1462, when it was retaken by the Spaniards, and it has continued in the hands of the Christians from that time. The English took it from the Spaniards during the war of the succession in Spain; the fort surrendered to the united fleet of England and Holland under sir George Rook, in 1704; and the allies took possession of it in the name of Charles III. The place was ceded to the English by the treaties of Utrecht and Seville; it was besieged at several times without success. Since the English have been masters of the place it has been so much improved and strengthened, as probably to bid defiance to the utmost efforts of an enemy. In the course of the American war, the Spaniards again besieged it; but their memorable attack with floating batteries of upwards of 200 cannon, in ships of all sizes, terminated only in disappointment, in the destruction of the ships and men employed, and in the immortal honour of the brave defenders: 16 miles N. of Ceuta, 70 S. of Seville. N. lat. 36° 44'. W. long. 5° 19' 46'.

GIBRALTAR, an ancient town of South America, in the government of Caraccas, and province of Venezuela, situated on the E. coast of the lake Maracaybo. The country in its vicinity is well watered with rivers, and furnishes cocoa of the best quality, and very large cedars. The best Spanish tobacco is produced here, called Tobago de Maracaybo, from which is made the valuable snuff, vulgarly called "Macakaba" snuff. The air is very insalubrious in the rainy season, and therefore

the merchants and planters retire at that time to Maracaybo, or Merida: 100 miles S.S.E. of Maracaybo. N. lat. 10 4' W. long. 67° 36'.

**GIBRALTAR Point**, is the western extremity of a sandbank, in Upper Canada, which forms the harbour of York, and upon which block-houses are erected for its defence. There is another place of this name on the side of lake Memphramagog, in the town of Bolton, in Upper Canada.

**GIBRIN**, a town of Syria; 10 miles S.E. of Aleppo.

**GIBSON, RICHARD**, in *Biography*, the Dwarf, was placed by a lady at Mortlake, to whom he was page, with Francis de Clyne to learn to paint, both in water and in oil; but he informed himself more by studying the works of Lely, and gained considerable reputation.

**GIBSON, EDWARD**, in *Biography*, was born at Bampton, in Westmoreland, in the year 1669. He received the early part of his education at the free-school in his native town, and at the age of seventeen he was sent to Queen's college, Oxford. In 1691 he was admitted to the degree of B. A., and in the same year, having already applied himself most diligently to the study of the northern languages, he published a new edition of William Drummond's *Polemio-Middiana*, and James V. of Scotland's *Cantilena Rustica*, quarto, illustrated with notes. In 1692, he gave a translation in the Latin language, together with the original, of the "*Chronicon Saxonicum*;" likewise a work entitled "*Librorum Manucriptorum in duabus insignibus Bibliothecis, altera Dugdaliana Oxonii, Catalogus*," with a dedication to Dr. Tension, afterwards archbishop of Canterbury, which proved the foundation of the author's subsequent fortune under the auspices of that prelate. He next published a correct edition of Quintilian "*De arte Oratoria*;" and a new edition of Somner's treatise on the Roman ports and forts in Kent. In 1694 Mr. Gibson commenced A.M., and shortly afterwards was elected fellow of his college, and admitted into deacon's and priest's orders. In 1695 he published an English translation of "*Camden's Britannia*." This work was patronized by lord Somers, who offered Mr. Gibson a living in the isle of Thanet, which he declined, on account of ill-health, and in the following year he was appointed librarian at Lambeth, by the archbishop, Dr. Tension, who received him into his family, and who appointed him morning preacher at Lambeth church. His publications about this period were, "*Vita Thomæ Bodleii, Equitis Aurati*," together with "*Historia Bibliothecæ Bodleianæ*;" also, "*Reliquiæ Spelmanianæ*;" being the posthumous works of sir Henry Spelman, relating to the Laws and Antiquities of England, together with the *Life of the Author*." He was now appointed domestic chaplain to the archbishop, through whose means he obtained the lectureship of St. Martin's in the Fields, and was presented to the rectory of Stiffed in Essex. His promotion in the church went on rapidly, but it did not render him indifferent to the cause of literature, and in 1713 he published his celebrated work, entitled "*Codex Juris Ecclesiastici Anglicani*;" or the statutes, constitution, canons, rubrics, and articles of the church of England, methodically digested under their proper Heads, &c." The scheme of church power vindicated in this volume was excepted against, not only by dissenters, but by the soundest and most constitutional lawyers within the pale of the church; who maintained that the principles and claims advanced in it would be sufficient, if acted upon, in their utmost extent, to establish a sacerdotal empire, which must draw all power to itself, and render the civil magistrate its minister and dependent. In 1715 our author, who had taken his degree of D.D., was consecrated bishop of Lincoln, and in 1723 he was translated to the see of Lon-

don. In this situation, on account of the weak health of Dr. Wake, then archbishop of Canterbury, almost every thing relating to the affairs of the church was confided to him. His great zeal for the established religion, and his opposition to the dissenters, who were endeavouring to obtain the repeal of the Corporation and Test acts, lessened him in the estimation of the prime minister, sir Robert Walpole; and he was, about the same time, rendered obnoxious to men in power, by several attacks on the principles in his "*Codex*," which the authors contended were inimical to the civil constitution of this country, and favourable to a spirit of intolerance and persecution. Of these attacks, one of the most able was conducted by the recorder of Bristol, afterwards Mr. Justice Foster, at the desire of lord Hardwicke, lord chief-justice of the court of king's bench. Bishop Gibson's constitution was naturally strong and vigorous, but he exercised it with almost incessant labours, so that, at length, it might be said to be fairly worn out by his studies and exertions. For some time before he died, he became sensible that his end was approaching, and in 1748 he breathed his last at Bath, being in his seventy-ninth year. Besides the works already enumerated, the bishop was author of several others, highly esteemed by the learned. He wrote and published many pastoral letters, addressed to the clergy and laity of his diocese, intended to oppose the growth of indelicacy and enthusiasm: some visitation charges, occasional sermons, and small tracts against the prevailing vices of the age. These smaller pieces have been frequently reprinted, and it is said that the bishop received more real satisfaction on account of the repeated demand for his practical works, than from the honours conferred on him by his larger and more learned treatises. He possessed the social principles in an eminent degree, and his beneficence and charity were very extensively, though privately, exercised. An instance of liberality is recorded, which redounds greatly to his honour: Dr. Crow had left him by his will 2500*l.* which bishop Gibson freely gave to Dr. Crow's own relations, who were in indigent circumstances. *Biog. Brit.*

**GID**, or **GIDDY**, in *Rural Economy*, a morbid condition occurring in sheep and some other animals, in which there is a constant vertigo or turning round. The affection is generally considered as a kind of hydrocephalus, or encysted collection of watery matter in the head, between the dura and pia mater.

It has, however, been suggested by some as depending upon a worm or maggot under the horn on either side of the head; in support of which Mr. Collins has been informed of cows having the disease, and being cured by having a perforation made near the horn, and the worm or maggot taken out; but this is no doubt another sort of disorder.

Some farmers consider this complaint as the most common among sheep that are richly fed, and know it by the name of the *flurly ail*, the cure being attempted by the use of small bleeding and a*sa*fetida; and in order to guard against a relapse, the sheep should be put into a hilly or elevated pasture.

Among the graziers in the county of Lincoln the disease is known by the terms *flurly*, and *ladder on the brain*, and in its remedy a sort of trepanning process is had recourse to, by which great numbers of sheep are supposed to be saved. The person who performs the operation raises the scalp with a strong hooked knife just over the part affected, to the extent of about half a crown's piece, after which, nearly the same extent of the skull-bone is elevated, letting it hang as by a hinge on one side; then by means of a quill, cut slanting to a point, in the form of a spear, and hacked on each side, the bladder is sought for and brought out whole, the

bone being immediately put down again, and covered with a plaster.

The South Down sheep farmers, when the animals are affected in this way, say they are *pateris/b*.

Various other modes of cure have been proposed, but they do not seem worthy of much attention. See SHEEP.

GIDDA, in *Ancient Geography*, See IDDA.

GIDDATOOR, in *Geography*, a town of Hindoostan, in the circle of Cicacole; 16 miles S.W. of Cossimcotta.

GIDDINESS, in *Medicine*, a sensation as if the objects surrounding the person were in a state of circumgyration, or whirling motion, accompanied with an inability to maintain the erect posture, or to move forward in a straight line: in technical language this is denominated *Vertigo*; which see.

GIDDRI, in *Geography*, a town of Albania; 8 miles N. of Aleffio.

GIDEA, a river of Sweden, which rises in the Lappmark of Afele, and traversing Angermanland, runs into the gulf of Bothnia. N. lat. 16° 20'. E. long. 18° 54'.

GIDELLI, a town of Candahar; 50 miles S.E. of Cabul.

GIDID, a town of Africa, in Dar-für, nearly S.E. and about 22 miles from Cobbé, on the road from Cobbé to Ril. This town has a competent supply of water; and yet the Fukkara, who possess it, are supposed to be so destitute of hospitality, that they will hardly furnish a traveller sufficient to allay his thirst. In this town are many houses, and some of them belong to merchants who derive their origin from the eastward.—Also, a town of Nubia; 35 miles S. of Gerri.

GIDI-SHEHRI, a town of Asiatic Turkey, in Natolia; 8 miles S. of Beishehri.

GIDOLA, a town of Russia, in the government of Wiburg; 20 miles N. of Wiburg.

GIECH, a town of Germany, in the bishopric of Bamberg; 7 miles N. of Bamberg.

GIEDKULISZKI, a town of Samogitia; 24 miles S. of Rosenne.

GIEDROYCE, a town of Lithuania, in the palatinate of Wilna; 24 miles N.N.W. of Wilna.

GIEDÜNGEN, a town of Norway, in the diocese of Christianstadt; 18 miles N.W. of Stavanger.

GIEGUZIN, a town of Lithuania; 15 miles S. of Wilkoniers.

GIEK, in *Botany*, the Ceylon name of a small fruit, described by Gärtner v. 2. 486. t. 180, of which nothing more is known. The nucleus is singularly pitted, like a *Rulus*, but if the figure be in all points correct, it cannot be a grain of the fruit of that genus. The internal parts, which were decayed, might have ascertained something decisive, especially the situation of the embryo.

GIELLUM, in *Geography*, a town of Norway, in the diocese of Aggerhuus; 53 miles N. of Chrilliana.

GIEN, a town of France, and principal place of a district, in the department of the Loiret, seated on the Loire; 32 miles S.E. of Orleans. The place contains 5117, and the canton 11,366 inhabitants, on a territory of 410 kilometres, in 11 communes. N. lat. 48° 45'. E. long. 10° 13'.

GIENE'. See KENÉ.

GIENSOR, a town of Africa; 10 miles S. of Tripoli.

GIER, a river of France, which runs into the Rhône, 12 miles below Lyons.

GIERACE, a town of Naples, in Calabria Ultra, the see of a bishop, suffragan of Reggio; containing 13

churches, and 4 monasteries. Near it are some sulphureous baths; 34 miles N. of Reggio. N. lat. 38° 6'. E. long. 16° 30'.—Also, a town of Sicily, in the valley of Demona; 30 miles S.W. of Mitretta. N. lat. 37° 48'. E. long. 14° 22'.

GIERANONY, a town of Lithuania, in the palatinate of Wilna; 20 miles N.E. of Lida.

GIERGA, a town of Bengal; 48 miles S.E. of Dacca.

GIESIM, a town of Nubia, between Sennaar and Abyssinia; 100 miles E.S.E. of Sennaar. N. lat. 13° 16'. E. long. 35° 15'.

GIESSEN, a strong town of Germany, in the principality of Upper Hesse, situated in a fertile country, on the Lahn. It is defended by a good citadel and arsenal. An university was founded here in the year 1605; 36 miles N.E. of Mentz. N. lat. 50° 35'. E. long. 8° 43'.

GIEZIN, a town of Samogitia; 22 miles E.S.E. of Rosenne.

GIFFÆ, a term in *Surgery*, signifying swellings behind the ears.

GIFFEN, HUBERT, in *Biography*, a lawyer and philologist, was a native of Gueldres in France. He studied at different universities, as those at Louvain, Paris, and Orleans, and in 1567 he took his degrees in the law. He went to Venice in the train of the French ambassador, and from thence to Germany, and taught philosophy and jurisprudence at Strasburg, Altdorf, and Ingolstadt. He was educated in the principles of Protestantism, which he renounced for the Catholic religion previously to his being invited to the imperial court, where the emperor Rodolph bestowed upon him some important offices. Being sent into Bohemia, he died at Prague in the year 1604, being about seventy years of age. His principal works are "Comment. de Imp. Juliano;" "Index Hist. Rerum Romanorum;" and notes and comments upon Aristotle's politics, ethics; also upon Lucretius. Moreri. Bayle.

GIFFT-MEHL, the name given by the German chemists and metallurgists to the first appearance of arsenic, or the grey flowers arising from the roasting of cobalt, and sticking to the long wooden funnel, which they carry from the furnaces.

The word gifft-mehl is German, and signifies poisonous meal or flour.

GIFHORN, in *Geography*, a town of Germany, in the principality of Lunenburg-Zell, seated on the Allier; 19 miles E. of Zell.

GIFONI, a town of Naples, in Principato Citra; 7 miles E. N. E. of Salerno.

GIFT, or GRANT, in *Law*, a method of transferring personal property, answering in some measure to the conveyances of real estates. Gifts and grants are thus to be distinguished from each other, that *gifts* are always gratuitous, whereas *grants* are upon some consideration or equivalent. With regard to their subject-matter, they may be divided into gifts or grants of chattels *real*, and gifts or grants of chattels *personal*. Under the former class may be included all leases for years of land, assignments, and surrenders of these leases; and all the other methods of conveying an estate less than freehold; though these very seldom carry the outward appearance of a gift, however freely bestowed: being usually expressed to be made in consideration of blood, or natural affection, or of five or ten shillings nominally paid to the grantor; and in case of leases, always reserving a rent, though it be but a pepper-corn:—any of which considerations will, in the eye of the law, convert the gift, if executed, into a grant; if not executed, into a contract.



Grants or gifts of chattels *personal* are the act of transferring the right and the possession of them; whereby one man renounces, and another man immediately acquires, all title and interest therein: which may be done either in writing or by word of mouth, attested by sufficient evidence (Park. 57), of which the delivery of possession is the strongest and the most essential. But this conveyance, when merely voluntary, is somewhat suspicious; and is usually construed to be fraudulent, if creditors or others become sufferers thereby. And, particularly, by statute 3 Hen. VII. c. 4. all deeds of gift of goods, made in trust to the use of the donor, shall be void; because otherwise persons might be tempted to commit treason or felony, without danger of forfeiture; and the creditors of the donor might also be defrauded of their right. And by statute 13 Eliz. c. 5. every grant or gift of chattels, as well as lands, with an intent to defraud creditors or others (3 Rep. 82), shall be void, as against such persons to whom such fraud would be prejudicial: but, as against the grantor himself, shall stand good and effectual; and all persons partakers in, or privy to, such fraudulent grants, shall forfeit the whole value of the goods, one moiety to the king, and another moiety to the party grieved; and also, upon conviction, shall suffer imprisonment for half a year.

A true and proper gift or grant is always accompanied with delivery of possession, and takes effect immediately; as if A. gives to B. 100*l*. or a flock of sheep, and puts him in possession of them directly, it is then a gift executed in the donee; and it is not in the donor's power to retract it, though he did it without any consideration or recompence (Jenk. 109.): unless it be prejudicial to creditors; or the donor were under any legal incapacity, as insanity, coverture, duress, or the like; or if he were drawn in, circumvented, or imposed upon by false pretences, ebriety, or surprize. But if the gift does not take effect, by delivery of immediate possession, it is then not properly a gift, but a contract; and this a man cannot be compelled to perform, but upon good and sufficient consideration. See CONTRACT.

The conveyance by *gift*, "donatio," is properly applied to the creation of an estate-tail, as feoffment is to an estate in fee, and lease to that of an estate for life or years. It differs in nothing from a feoffment, but in the nature of the estate passing by it; for the operative words of conveyance in this case are *do* or *dedi* (Weit. Symbol. 256.); and gifts in tail are equally imperfect without livery of seisin, as feoffments in fee-simple. (Litt. § 59.) See FEOFFMENT. This is the only distinction which Littleton seems to take, when he says (§ 57), "it is to be understood, that there is feoffor and feoffee, donor and donee, lessor and lessee;" viz. feoffor is applied to a feoffment in fee-simple, donor to a gift in tail, and lessor to a lease for life, or for years, or at will. In common acceptance gifts are frequently confounded with grants. (See GRANT.) Black<sup>4</sup>. Com. B. ii.

GIFT-day, in *Rural Economy*, is a term implying a boon-day, or a day's work given from the tenant to the lord, or from neighbour to neighbour.

GIFTS, *New Year's*. See STRENÆ.

GIG, FISH. See FISH-gig.

GIGA, *Ital.* GIGUE, *Fr.* a jig, the name of a gay dance, and of its tune. The Crusca Dict. defines this word from Dante, par. 14. *strumento musicale di corde*; a musical instrument with strings. The Crusca, likewise, says, that it is an instrumental movement, so called.—Walther's derivation from *Geige*, *Germ.* a violin, or fiddle, comprehends both the tune and the instrument upon which, originally, it was most frequently played. The time of the *ggia*, or jig, is always quick, and in triplets of  $\frac{6}{8}$ ,  $\frac{9}{8}$ , or  $\frac{12}{8}$ .

Corelli's jigs were long in favour; but, being in the same time as most of our old country-dances, they are almost all become vulgar, except the *gighe* in his 5th solo, and 11th sonata, op. ii<sup>a</sup>.

Roussseau says that *gigues* are now wholly out of fashion in Italy and France; but the movement is only improved by new and more elegant passages: for, whatever is played quick, in triplets of 6, 9, or 12 quavers in a bar, is still a *giga*, or jig.

GIGALA, GIGHA, *Gia*, or *Gigo*, in *Geography*, one of the smaller western island of Scotland, about 7 miles long and 2½ broad, partly rocky and partly arable, situated in N. lat. 55 36'. W. long. 5 43, and separated from the peninsula of Cantyre, or Kintyre, by a channel 3½ miles broad. There are no trees in this island; but oaks are sometimes dug up in the morasses. Near its centre is Dun-cliff, a high steep rock, flat at top, which appears to have been a strong fortification. At Kilchattan is a rude column, 16 feet high, 4 broad, and 8 inches thick, and near it is a cairn. On the western shore, which is bold and rocky, there are two remarkable caves; and on the S. coast is a subterraneous passage 133 feet in length. Between the projecting points and sunk rocks on the E. coast are creeks, in which vessels may be safely moored. This island contains 592 inhabitants.

About 1½ mile S. from Gigha, is the island Caray, or Cara, near a mile long and half a mile broad, containing 22 inhabitants. The shores are every where high and rocky, except at the N. E. end, where is the only landing place. The Mull of Cara, at the S. end, is a perpendicular rock 167 feet high. At the N. E. end, the soil is a mixture of shells, sand, and common mould; the rest of the island, at the surface, is a stratum of peat earth. Between Gigha and Cara is Gigulum, a small uninhabited island.

GIGANTES, a cluster of small islands among the Philippines, N. W. of Sibiu. N. lat. 11° 42'. E. long. 123° 20'.

GIGANTIC. See GIANT.

GIGANTIC Order, in *Architecture*, a name given by Scamozzi and others to the Tuscan order.

GIGANTOMACHIA, the battle of the giants against the fabulous gods of the ancient heathens. See GIANT.

The word is Greek, γίγαντομαχία, formed of γίγαντες, *giants*; and μάχη, *combat*, of μάχομαι, *ugno*. I fight.

Several of the poets have composed gigantomachias: that of Scarron is the finest of all his pieces.

GIGANTOPHONTES, is a name given to Minerva, on account of the assistance which she gave to Jupiter in his contest with the giants.

GIGAY, in *Geography*, a small island of the Hebrides, on the E. coast of Barra, yielding tolerable pasture, but difficult of access.

GIGERI. See JIBEL.

GIGERLÆ, a term used by some writers to express the offals of poultry of any kind, including the intestines, extremities, and whatever else is thrown away before the dressing. See GIBLETS.

GIGG, GIGA, or *Jig*, in *Music and Dancing*. See GIGA.

GIGGS, among *Farriers*, small bladders or blisters on the inside of a horse's hps. They must be laid open, and cleaned with salt and vinegar, or alum-water.

GIGGE, in the *Manufacture of Flax*, denotes a hole made in the earth, where fire is made to dry the flax laid over it.

GIGGEO, ANTHONY, in *Biography*, a learned Italian, who flourished in the early part of the seventeenth century, and was admitted to the degree of doctor by the Ambro-

fian college at Milan. He was author of many learned works, but that on which his reputation is chiefly established, was entitled "Theſaurus Linguae Arabicae, ſeu Lexicon Arabico-Latinum;" published in four volumes folio, in 1632. As a recompence for the learning and induſtry which it exhibited, pope Urban VIII. nominated the author to an honourable poſt in a college at Rome; but he died before he could enter upon its functions, or enjoy its emoluments. Gen. Biog.

**GIGLIO**, or **ISOLE DEL GIGLIO**, in *Geography*, a ſmall iſland in the Mediterranean, near the coaſt of Italy, anciently called *Ægilum*, or *Igilum*. N. lat. 42° 28'. E. long. 10° 53'.

**GIGMILLS**, a kind of fulling mills, for fulling and burling of woollen cloth, prohibited, anno 5 and 6 Ed. VI. c. 22.

**GIGNEE**, in *Geography*, a town of France, in the department of the Herault, and chief place of a canton, in the diſtrict of Lodève, ſeated on the Herault; 10 miles S. E. of Lodève. The place contains 2785, and the canton 13,632 inhabitants, on a territory of 290 kilometres, in 21 communes. N. lat. 43° 39'. E. long. 3° 38'.

**GIGNY**, a town of France, in the department of the Jura, on the Surain; 7 miles S. W. of Orgelet.

**GIGO**. See **GIGALA**.

**GIGOT**, in the *Manege*, a branch after the form of a gigot, or leg, is a branch, the lower part of which is round, and called in French *gargouille*.

**GIHON**, in *Geography*. See **JIHON** and **AMU**.

**GIHON**, in *Scripture Geography*, a fountain, weſt of Jeruſalem, where Solomon was anointed king by Zadok and Nathan. The upper channel of Gihon was ordered, by Hezekiah, to be conveyed into Jeruſalem, for the advantage of the waters; 1 Kings, i. 33. 2 Chron. xxxiii. 30.—Alſo, the name of one of the four rivers, whoſe ſources were in Paradife, Gen. ii. 13. The Arabians believed this to be the Oxus, a river which riſes in the mountains of Imaus, and runs from eaſt to weſt; and after winding much, returns, and diſcharges itſelf into the Caſpian ſea, weſtward. This river ſeparates the provinces of the Turks and Perſians. Modern geographers call the Oxus, *Amu*; which ſee. The Arabians name it *Gehon*, and *Neher-Balkh*, the river of Balk, becauſe it paſſes through that city. Calvin, Scaliger, and others, think that Gihon is the moſt weſtern channel of the two made by the Tigris and Euphrates, when, after their conflux, they ſeparate again to enter the ſea. Others again maintain that Piſon is the weſtern channel, and that Gihon is the eaſtern. This is the opinion of Bochart and Huetius. (See **EDEN**.) Others ſuppoſe the Gihon to be the *Araxes*; which ſee.

**GIJON**, *Jiva* of the Romans, a conſiderable ſea-port town of Spain, in Aſturias, formerly the capital of this province, with an old caſtle, containing about 800 families, 18 miles N. of Oviedo. This infeſecure port, conſtructed and maintained at a great expence, is reſorted to by the Engliſh for filberts and cheſnuts. N. lat. 43° 32'. W. long. 5° 42'.

**GIKRI**, a town of Hindooſtan, in the circar of Nagore; 15 miles S. E. of Catchwara.

**GIL**, *Iſland of*, an iſland of the North Pacific ocean, ſo called by ſignor Caamano, about 14 miles long and 6 broad, between Princeſs Royal's iſland and Pitt's Archipelago.

**GILA**, a river of New Mexico. See **COLORADO**.

**GILACAN**, a ſmall iſland in the North Pacific ocean, N. of the Catanduanes. N. lat. 14° 26'. E. long. 124° 27'.

**GILARZA**, a town of the iſland of Sardinia; 15 miles S. E. of Boſa.

**GILATTELKE**, a town of Tranſylvania, 14 miles N. of Clauſenburg.

**GILBERGA**, a town of Sweden, in Warmeland; 24 miles W. of Carliſadt.

**GILBERT**, **HUMPHREY**, in *Biography*, deſcended from an ancient family in Devonſhire, was born about the year 1539. His mother, after becoming a widow, married Mr. Raleigh, by whom ſhe had ſir Walter; of courſe, Humphrey Gilbert and ſir Walter were half brothers, and, as we ſhall ſee, both became diſtinguiſhed in the annals of their country. The ſubject of the preſent article was educated at Eton, and from thence was ſent to Oxford to complete his ſtudies. He ſoon exhibited a turn of mind better adapted to an active than a literary life. He was early introduced to the court of Elizabeth, and there acquired that ardour of loyalty which ſeemed to be the ruling paſſion of thoſe who approached the queen. His firſt expedition as a warrior was at Havre, in 1563, after which he was ſent over to Ireland, to aſſiſt in quelling the diſorders in that country, and roſe to the chief command in the province of Munſter. In 1570 he received the honour of knighthood as a reward for his ſervices. In the following year ſir Humphrey Gilbert ſerved, as a burgeſs, in parliament, for Plymouth; and in 1572 he failed with a reinforcement to colonel Morgan, then acting in Flanders. He, about this period, became anxious for the advancement of maritime diſcovery, and the improvement and extenſion of trade and commerce; with theſe views, in 1576, he published "A Diſcourſe, to prove a paſſage by the north-weſt to the Eaſt Indies." He probably deſigned to make attempts for the diſcovery of this paſſage, but an anterior project was that of ſettling ſome of the countries in the northern part of the New World. In 1578 he obtained a patent from the crown for making ſettlements in the unoccupied lands of North America, and fitted out an expedition with which he failed for Newfoundland, where he continued a ſhort time, and returned without having effected any thing of importance. He, however, perſiſted in his deſign, and in 1583, in company with his brother, ſir Walter Raleigh, returned to Newfoundland, and took poſſeſſion, in the queen's name, of the harbour of St. John, and granted leaſes of the circumjacent country to thoſe of his company who choſe to take them. He carried out with him a Saxon miner, in hopes, no doubt, of finding gold, more than ſufficient to repay them for all their trouble and labour. This man pretended to have diſcovered a rich ſilver mine on the coaſt, and dug up ſome ore, which ſatiſfied ſir Humphrey that the means of wealth were within their reach. He now fully expected that he could obtain from the queen the loan of ten thouſand pounds, to enable them to proſecute their diſcoveries, but his voyage was truly diſaſtrous; the laſteſt ſhip was loſt in a ſtorm, with all the crew except twelve men, and the miner and the ore periſhed at the ſame time. He himſelf had fortunately gone on board a ſmall ſloop, for the purpoſe of exploring the coaſt. After this he reſuſed to ſhift his ſtation to his larger remaining veſſel, being reſolved not to deſert the little crew with whom he had encountered ſo many dangers. He ſteered homeward, in the miſt of a tempeſtuous ſea, and on the ninth of September, when his ſmall bark was in the utmoſt danger of foundering, he was ſeen, by the crew of the other ſhip, ſitting in the ſtern of the veſſel, with a book in his hand, and he was heard to cry out, "Courage, my lads! we are as near heaven at ſea as at land." About midnight the bark was ſwallowed up by the ocean; the gallant knight and all his men periſhed with her. Though ſir Humphrey Gilbert did not effect a ſettlement at Newfoundland, yet the pro-

ject was soon after realized under his patent, so far as to be of great advantage to the fishery from this country. Biog. Brit.

GILBERT, or GILBERD, WILLIAM, a physician, was born, in the year 1540, at Colchester, of which borough his father had been recorder. After studying some time at Cambridge, he travelled abroad for farther improvement in those branches of science to which he was particularly addicted; and took the degree of doctor of physic in some foreign university. He returned to his own country with a high character for philosophical and chemical knowledge, and was made a member of the College of Physicians in London, where he settled about the year 1573. He practised with so much reputation and success, that he at length became first physician to queen Elizabeth, in which office he continued during the life of that princess. The vacancies from the duties of his profession he employed in the pursuit of philosophical experiments, particularly relative to the magnet, and in these he was assisted by a pension from queen Elizabeth. We are informed of no other circumstances concerning the life of this learned man, who died, unmarried, November 20, 1603, aged 63, and was buried in his native place, where a handsome monument was erected to his memory by his brothers. He left all his books, globes, mathematical instruments, and cabinet of minerals, to the College of Physicians. His picture, which represents him as of a tall stature and cheerful countenance, is in the gallery over the schools at Oxford.

The capital work of Dr. Gilbert, entitled "De Magnete, Magneticisque Corporibus et de Magno Magnete Tellure, Physiologia nova, plurimis et argumentis et experimentis demonstrata," was first published at London in 1600, and has been reprinted in Germany. This is not only the earliest complete system of magnetism, but also one of the first specimens of a philosophical system built upon experiments, after the manner so much insisted on afterwards by the great lord Bacon. Aikin, Biog. Mem. of Med. Eloy.

GILBERT, JOHN, the son of Mr. Thomas Gilbert, a gentleman possessing an estate of about 300*l.* a year, was born in the year 1724. His eldest brother had a liberal education, with a view to the bar, and became afterwards a member of parliament for Newcastle and Litchfield; but the subject of this article had only such instruction as the obscure village of Farley, in the neighbourhood of his father's house, could afford. At the age of twelve or thirteen years, he was bound apprentice to Mr. Bolton, father of the well-known and justly celebrated Matthew Bolton, of Soho, near Birmingham; between whom and Mr. Gilbert an intimacy subsisted, as long as the latter lived. At the age of 19 he lost his father; and as he died possessed of extensive lime-works, they required attention. Accordingly Mr. Gilbert, in order to undertake the superintendance of them, quitted his connection with Mr. Bolton, who very reluctantly parted with him, and devoted himself to the management of his own family concerns. Notwithstanding the disadvantages under which Mr. G. had laboured in early life, he possessed talents, which, matured by age and experience, could not fail of recommending him to notice. But the most remarkable circumstance in the history of this ingenious person, and that indeed which has induced us to give a brief account of him, was his introduction to the duke of Bridgewater, at the time when he was projecting improvements of his collieries, in the neighbourhood of Manchester. Mr. Gilbert's brother was then steward to the duke; and desired him to inspect and examine his Grace's collieries at Worsley. After viewing the works, it immediately occurred to him, that if the coals on that part of the duke's estate could be brought

to market in such a populous town as Manchester, and for the supply of the numerous works in its vicinity, the colliery, which, in the state it was at the time of his inspection, yielded little profit, would become extremely valuable. It is said, that he excluded himself altogether from company for two days, at the Bull inn at Manchester, to consider how this might be done by water-carriage, as that by land was very expensive, and, on account of the badness of the roads, very inconvenient, and almost impracticable. Having digested his scheme, he communicated it to the duke, who was no less struck with the proposition suggested by Mr. G. than the projector himself. Accordingly the work was soon after begun. Mr. G.'s name has seldom occurred in connection with this very important and lucrative undertaking; and as he preceded Mr. Brindley in this business, of which we have ample and satisfactory evidence, we thought that justice required a candid and impartial statement of the case. Mr. G. was so fortunate, in the prosecution of this work, as to find lime upon the duke's estate, which may otherwise have been brought by land from Buxton, at the distance of near 30 miles; and in a work of this great extent, this was no inconsiderable saving. The tunnel was entirely executed, as well as planned, by Mr. G.; who, being acquainted with Mr. Brindley as a neighbour, and knowing him to be a very ingenious and excellent nail-wright, engaged his assistance in the conduct and completion of this arduous undertaking, and introduced him to the duke for this purpose. The duke was so well satisfied with his agent and projector, that at first they lived together for two or three months in the year, and for several of the best years of Mr. Gilbert's life, he spent half his time with him. In June, 1757, he removed with his family to Worsley, that he might, with greater convenience, attend the prosecution of the business he had undertaken. As a farther evidence of the duke's regard for Mr. G. we may here add, that he gave his son, who was educated for the church, the second best preferment at his disposal, to the amount of about 1200*l.* per annum. We might mention many other concerns in which Mr. G. was engaged, and in which he had an opportunity of manifesting his skill and judgment, in the conduct of canals, mines, and other improvements relating to rural economy. We shall merely add, that he is said to have been the first person who suggested the use of gun-powder in obtaining rock-salt. Mr. G. was probably too modest and unassuming, that he did not, during his life-time, lay claim to the honour which belonged to him, with respect to the duke of Bridgewater's canals and collieries; and we have introduced his name into the Cyclopaedia, in order to do him justice, without meaning to detract from the merit of his coadjutor and successor, Mr. Brindley, to whom we have already paid ample and deserved respect under his biographical article. Mr. Gilbert's general character commanded the esteem of all who knew him, and his death, even after a prolonged life of about 73 years, which happened at Worsley, on the 4th of August, 1757, was, without doubt, regretted by his friends, and especially by the noble duke, who was in the house at the time.

GILBERT'S *Island*, in *Geography*, an island near the S.W. coast of Terra del Fuego. N. lat. 55 13' W. lon. 57 57'

GILBERT'S *Town*, a town of America, in the state of Virginia, seated on the Shenando, 30 miles N. of Charlottesville.

GILBERTINES, in *Ecclesiastical History*, an order of religious, thus called from St. Gilbert, of Sempringham, in the county of Lincoln, who founded the same about the year 1148: the monks of which observed the rule of St. Augustine, and were accounted canons; and the nuns that of St. Benedict.

The founder of this order erected a double monastery, or rather two different ones, contiguous to each other, the one for men, the other for women, but parted by a very high wall.

St. Gilbert himself founded thirteen monasteries of this order, *viz.* four for men alone, and nine for men and women together, which had in them seven hundred brethren, and fifteen hundred sisters. At the dissolution there were about twenty-five houses of this order in England and Wales.

GILBERTUS ANGLICUS, in *Biography*, the first practical writer on medicine, whom this country produced, is placed by Balz, who calls him *Gilbertus Logleus*, and says he was physician to Hubert, archbishop of Canterbury, in the reign of king John, about the year 1210. But Leland, without stating the grounds of his opinion, makes him more modern. Dr. Freind observes, that it is obvious, from the work by which he is principally known, (a "Compendium of Physic,") that he must have lived several years later in the thirteenth century, very probably in the beginning of the reign of Edward I: "For he quotes Averrhios," Dr. Freind remarks, "who reached to the close of the twelfth century; and whose works could not have been translated so early, and indeed were not translated till the middle, at least, of the thirteenth, as Bacon, a good voucher, informs us: and the mention he makes of a book, "de Speculis," which, without doubt, is that written by Bacon, and what he transcribes from Theodorick, concerning a leprosy, evidently shews that he lived low in this century, &c." (*Hist. of Physic*, vol. ii. p. 267.) According to Leland, he maintained a high character for his knowledge in philosophy and physic, which he had acquired by great study and much travelling; and he was very successful in his practice. His writings are principally compiled from those of the Arabian physicians, like the works of his contemporaries in other nations; sometimes, indeed, he transcribes whole chapters word for word, especially from Rhazes. He is represented as the first English physician who ventured to expose the absurd practices of the superstitious monks, who at that time engrossed much of the treatment of diseases, and is said to have contrailed with them the methods recommended by the ancients. The principal work of Gilbert, entitled "Compendium Medicinæ tam morborum universalium quam particularium," was corrected by Michael Capella, and printed at Lyons in 1510; and afterwards at Geneva, in 1608, under the title of "Laurea Anglicana, seu Compendium totius Medicinæ." His other treatises were, "De viribus Aquarum;" "De Re Herbaria;" "Thesaurus Pauperum;" and "De tuenda valitudine." Eloy, *Diet. Hist.* Freind, *loc. cit.*

GILBING, in *Geography*, a town of Prussia, in Ermland; 12 miles W. of Allenstein.

GILBOA, in *Scripture Geography*, a mountain of Palestine, celebrated on account of the defeat and death of Saul, and his son Jonathan. (1 Sam. xxxi. 1, 2, 3.) Eusebius and Jerom place this mountain six miles from Bethsan, otherwise Scythopolis.

GILD, or GUILD, originally signifies a fraternity, or company.

The word is formed from the Saxon *gildan*, to pay, because every man was *gildan*, i. e. to pay something towards the charge and support of the company. Hence also our Guildhall, *q. d.* the hall of the society or fraternity, where they meet, and make orders and laws among themselves.

The origin of guilds, or guilds, is thus related: it being a law among the Saxons, that every freeman of fourteen years old should first surties to keep the peace, or be committed: cert. in neighbours, consisting of ten families, entered into an association, and became bound for each other,

either to produce him who committed an offence, or to make satisfaction to the injured party: that they might the better do this, they raised a sum of money among themselves, which they put into a common stock; and when one of their pledges had committed an offence, and was fled, then the other nine made satisfaction out of this stock, by payment of money, according to the offence.

Because this association consisted of ten families, it was called a *decennary*; and from hence came out later kinds of fraternities.

But, as to the precise time when these guilds had their origin in England, there is nothing of certainty to be found; since they were in use long before any formal licence was granted them for such meetings.

It seems to have been about the close of the eleventh century, says Anderson, in his *History of Commerce*, vol. i. p. 70. that merchant-guilds, or fraternities, which were afterwards styled corporations, came first into general use in many parts of Europe. Mr. Madox, in his *Firma Burgi*, chap. i. § 9. thinks, they were hardly known to our Saxon progenitors, and that they might be probably brought into England by the Normans; although they do not seem to have been very numerous in those days. The French and Normans might probably borrow them from the free cities of Italy, where trade and manufactures were much earlier propagated, and where possibly such communities were first in use. See CHARTERS of Community, CITY, and CORPORATION.

Edward the Third, in the fourteenth year of his reign, granted licence to the men of Coventry to erect a merchant's gild and fraternity, of brethren and sisters, with a master, or warden; and that they might found chantries, bestow alms, do other works of piety, and constitute ordinances touching the same.

So Henry the Fourth, in his reign, granted a licence to found a gild of the Holy Cross, at Stratford-upon-Avon.

GILD, in the royal boroughs of Scotland, is still used for a company of merchants, who are freemen of the borough.

Every royal borough has a dean of gild, who is the next magistrate below the bailiff. He judges of controversies among men concerning trade; disputes between inhabitants touching buildings, lights, water-courses, and other nuisances; calls courts, at which his brethren of the gild are bound to attend; manages the common stock of the gild; and amerces, and collects fines.

GILD, or *Geld*, according to Camden, also signifies a tribute, or tax. See GELD.

GILD, according to Crompton, also signifies an amercement. As in foot-geld, which he interprets a prestation within the forest.

Hence, to be quit of all manner of gild, is to be discharged of all manner of prestations to be made for gathering sheaves of corn, lamb, and wool, to the use of foresters.

GILD, or *Geld*, is also used among our ancient writers for a compensation, or mulct, for a fault committed. See UN-GELD.

Hence, *werigeld* is the price of a man; *oxgild* is the price of cattle; *angeld*, the single value of a thing; *twigeld*, the double value, &c.

There are divers other words which end with *geld*, and shew the several kinds of payments; as *danigeld*, *radigeld*, *sew-geld*, *born-geld*, *sofgeld*, *penigeld*, &c. which see.

GILD, or *Gildrents*, are rents payable to the crown by any

any gild, or fraternity; or such rents as formerly belonged to religious gilds, and came to the crown at the general dissolution: being ordered for sale by the stat. 22 Car. II.

GILDABLE, or GELDABLE, denotes a person tributary, that is, liable to pay tax, or tribute.

Camden, dividing Suffolk into three parts, calls the first gildable, because liable to tax; from which the two other parts were exempt, because ecclesiæ donatæ.

GILDABLE is also explained in an ancient MS. to be that land or lordship which is *sub districtione curiæ vicecom.*

GILDAS, in *Biography*, furnished the *Wife*, a British monk, and the most ancient British writer now extant, was born in the year 520. He is known among many authors by the name of Badonius, by which he is distinguished from Gildas Albanus, who is said to have lived at an earlier period. His surname Badonius is derived from a memorable victory gained by the Britons over the Saxons, at the hill of Badon, now Bath, about the time of his birth. Having been carefully educated according to the manners of the times he became monk of Bangor, where he diligently applied himself to the learning of that period, and particularly to the study of the scriptures, with a view of qualifying himself for the duties of a public preacher. He is said to have visited Ireland at the request of Americus, afterwards king of the country, where he distinguished himself by his zeal and success in converting Pagans, confuting the heresies of the age, establishing monasteries, and in reforming the corrupt state of principles and manners which had become prevalent among the Christians in that island. Upon his return to his native country he visited the monastery of Lhan-carvan, lately founded by a pious nobleman of South Wales, and endeavoured, by all the means in his power, to engage other persons, eminent for rank and fortune, to follow his example. He spent some time in the northern parts of Britain; visited France and Italy, and then returned home, where he acquired a high reputation as a most indefatigable preacher who never hesitated to censure the prevailing vices of the age. He is supposed to have died at the abbey of Bangor in the year 590; though, according to some writers, this event happened at Glastonbury, full twenty years prior to this. The chief work of this author is; "Épistola de Excidio Britannia, et Castigatione Ordinis Ecclesiastici," containing lamentations over the miseries and almost total ruin of his countrymen, and very severe reproofs of the corruption and profligacy of manners in which all ranks were sharers, and of which he drew a most alarming picture. This curious remain of British ecclesiastical antiquities was first printed by Polydore Virgil in 1525, from an imperfect copy. It was afterwards published in 1568 by John Josse-line from another, and a more perfect manuscript copy, but the best edition was published by Dr. Thomas Gale, in the first volume of his "Hiloria Britannicæ, Saxonicæ, &c." Gildas wrote several "Letters," of which there are numerous fragments in an old collection of canons preserved among the MSS. in the Cotton library. Other pieces have been ascribed to him, but these are considered by the best judges, as not really his, among them is the "Hiloria de Gestis Britonum." Moreri.

GILDAS-de-Bois, Sr. in *Geography*, a town of France, in the department of the Lower Loire, and chief place of a canton, in the district of Savenay. The place contains 859, and the canton 5527 inhabitants, on a territory of 255 kilometres, in five communes.

GILDER. See GUILDER.

GILDHALDA TEUTONICORUM was used for the fra-

ternity of Easterling merchants in London; called also the *Jillyard*.

GILD-HALL, *q. d. Gilda aula*, the chief hall in the city of London. See GUILD-hall.

GILD-MERCHANT, *Gilda Mercatoris*, was a certain privilege, or liberty, granted to merchants, wher by they were enabled, among other things, to hold certain pleas of land within their own precincts.

King John granted *gildam mercatoriam* to the burgesies of Nottingham.

It is held, that if the king grants to a set of men to have "gildam mercatoriam," a mercantile meeting or assembly, this is alone sufficient to incorporate and establish them forever. 10 Rep. 30. 1 Roll. Abr. 513.

GILDING, or GUILDING, the art, or act, of spreading or covering certain substances with gold, either in leaf or powder, or in amalgam with quicksilver. See an account of these preparations of gold under GOLD.

The art of gilding was not unknown among the ancients, though it never arrived among them at the perfection to which the moderns have carried it. For this purpose the gold was beat into plates, with which the walls of apartments, dishes, and other vessels were covered. In early ages these plates were thick, so that this mode of gilding was very expensive. (See the process employed for gilding, in this manner, the horns of the ram brought by Nestor, as an offering to Minerva, in Homer's *Odyssey*, l. iii. v. 402.) In process of time, however, the expence was much lessened, because the art was discovered of making these plates thinner, and of laying them on with a size.

Pliny assures us, that the first gilding seen at Rome was after the destruction of Carthage, under the censorship of Lucius Mummius, when they began to gold the ceilings of their temples and palaces; the Capitol being the first place on which this enrichment was bestowed. But he adds, that luxury advanced on them so hastily, that in a little time you might see all, even private and poor persons, gild the very walls, vaults, &c. of their houses. "When we cover our houses with gold," says Seneca, (*Epist.* 115.) "what else do we than rejoice in deception? for we know, that coarse wood is concealed under that gold." We need not doubt but that they had the same method with us, of beating gold, and reducing it into leaves; though, it should seem, they did not carry it to the same height; if it be true, which Pliny relates, that they only made seven hundred and fifty leaves, four fingers square, of a whole ounce. Indeed, he adds, that they could make more; that the thickest were called *bractes Præfulsine*, on account of a statue of the goddess Fortune at Præneste, gilt with such leaves; and that those of the thinner sort were called *bractes quæstorie*.

The modern gilders also make use of gold leaves of divers thicknesses; but there are some so fine, that a thousand do not weigh above four or five drachms. The thickest leaves are used for gilding on iron, and other metals; and the thinnest on wood. But we have another advantage above the ancients, in the manner of using and applying the gold; the secret of painting in oil, discovered of late ages, furnishes us with means of gilding works that shall endure all the injuries of time and weather, which to the ancients was impracticable. They had no way to lay the gold on bodies that would not endure the face set with whites of eggs, or size; neither of which will endure the water; so that they could only gild such pieces as were sheltered from the moisture of the weather.

The Greeks called the composition on which they applied their gilding on wood, *κεφαλαιον*, or *κεφαλαιον*;

which is described as a sort of glutinous compound earth, serving, in all probability, to make the gold stick, and bear polishing. But as to the particulars of this earth, its colour, ingredients, &c. the antiquaries and naturalists are not agreed.

There are several methods of gilding in use among us: viz. *gilding on an oily size*; *gilding on a water size*; *gilding by the fire*, which is peculiar to metals; *gilding of books*, &c.

We may distinguish, in general, two kinds of gilding, one with, and the other without, the application of heat. The first method is practiced on those substances, such as wood, paper, leather, silk, lacquered and japanned ware, &c. which would be injured, and even destroyed at the temperature requisite for the other sort of gilding, which is employed on substances that are not liable to alteration by exposure to a moderate heat, such as metals, and sometimes glass and porcelain.

There are two methods of gilding on wood, viz. oil-gilding, and burnished gilding.

*GILDING in oil, or an oily size*, is performed by cementing the gold to the ground by means of fat oil. Linseed oil may be prepared for this purpose, by putting such a quantity of it into a broad vessel as may cover the bottom about an inch deep, and adding to it as much water as will rise six inches or more above the bottom. Let the vessel be exposed to the sun and rain, and the contents be occasionally stirred for five or six weeks, till the oil appear of the consistence of treacle. Then separate the oil from the water, and place it in a long bottle, or separating-funnel, used by the chemists, in such heat as will render it perfectly fluid; pour off the clear part, and strain the remainder through a funnel, and the whole will be fit for use. The water helps to clear and bleach the oil, and improve it in other respects.

In order to prepare the wood for gilding, it must first be covered or primed with two or three coatings of boiled linseed oil and white lead, in order to fill up the pores, and conceal the irregularities of the surface, occasioned by the veins in the wood. If greater nicety and perfection in the work be required, the wood should be first rubbed with fish-skin, and then with Dutch rushes.

When the priming is dry, the next operation is that of sizing the work, or laying upon it, by means of a brush, or a large pencil, a thin coat of gold size; care being taken that the brush or pencil be made to pass into all the cavities and projecting parts, if the subject be carved. This gold size is prepared by grinding calcined red ochre with a due proportion of the fat, or thickest drying oil that can be procured, (the older the better); and this size, in order to fit it for working more freely, is to be mixed, previously to its being used, with a small quantity of oil of turpentine, till it acquires a proper consistence. Sometimes the work is sized with fat oil, and the japanner's gold size (see *GOLD SIZE*), ground also with ochre. If a high degree of perfection be required, the work should be sized a second time, and some add a third sizing, before the gold is laid on. In order to ascertain its fitness for this purpose, it is touched with the finger; and if it feel somewhat adhesive or clammy, or, as the gilders call it, "tacky," let not so as to be brought off by the finger, it is in a fit state for gilding. But if it be so clammy as to daub, or come off on being touched, it is not sufficiently dry; or, if it has no clamminess or sticking quality, it is too dry, and must be sized over again before it is gilt. When the gold size is good, it will be sufficiently dry in about twelve hours for the application of the gold. In this

process, when the surface is sufficiently large and plain to contain them, the gold leaves may be laid on entire, either by means of a squirrel's tail, or immediately from the paper which originally contained them, which last method, practiced by those who have acquired the necessary dexterity, is the simplest and most expeditious, as well as the best, for the perfection of the work. The leaves, being laid on the proper parts of the work, must be settled to the ground, by gently compressing those, which seem to want it, with the squirrel's tail on a cotton ball; and if any part of the gold has flown off, or has been displaced, so as to leave any spot uncovered, a piece of another leaf, of a corresponding size and figure, must be laid upon it. When the parts are too small to admit of laying on whole leaves, or when vacancies are left, after laying on whole leaves, which require to be covered with the slips or fragments of leaves, those that are to be used are turned from the paper upon a cushion. (See *GILDING Cushion* and *CUSHION*) They are then cut into slips, of a proper size, by a blunt pallet-knife (see *GILDING Knife*); and each slip is taken up on the point of a fine brush, or by an instrument called the "tip," (see *GILDING Tip*), which, being moistened by breathing upon it, will take up the leaves, or any fragments of them from the cushion. When these are thus applied to the parts of the work that were to be covered, they are gently pressed down by the cotton ball, till they lie every where evenly upon the ground; and the gold will immediately adhere to the sticky surface of the size. Where the work is very hollow, and small pieces are wanted to cover parts that lie deep, they may be taken up, by the tip already mentioned, or the point of a fitch pencil, first breathed upon, and thus conveyed to, and settled in, their proper places. The whole of the work, being thus covered, should be suffered to remain till it be dry, and it may then be brushed over by a camel's hair pencil, or soft hog's hair brush, in order to clear away any loose particles of the gold leaf. If, after brushing, any defective parts appear, such parts must be again sized; and treated as before. The squirrel's tail used in gilding is cut short, and sometimes spread in the fan-fashion, by means of a piece of wood formed like a pencil-tick, but broad at both ends, and split to receive the tail; but it will equally serve in its own form, when the hair is cut to a proper length. The cotton should also be formed into a ball, by tying it up in a piece of fine linen rag; for if it be used without the rag, the fibres adhere to the gold size, and embarrass the work.

This sort of gilding is chiefly used for domes, and the roofs of churches, courts, banqueting-houses, &c. and for figures of plaster, lead, &c. that are to stand exposed to the weather.

This oil-gilding is the most simple and easy, least expensive, and most durable, as it will not be readily injured when exposed to the open air; and it may be also cleaned with a little warm water and a soft brush; but, as it cannot be burnished, it wants the high lustre which is produced by the method we shall next describe.

*GILDING, Burnished, or in Distemper, or on Water-size*, is that kind of gilding which is generally used for picture frames, mouldings, stucco, and such wooden works as are sheltered from the weather, and not subject to dampness. In order to prepare the wood for this sort of gilding, those parts that admit of it should be first well rubbed with fish-skin, and then with Dutch rushes. It should then be carefully covered with strong size, made of shreds, &c. of white leather, such as that used by glovers, or clippings of parchment boiled in water, in the proportion of about a pound of  
the



the shreds or clippings, to six quarts of water, to the consistence of a jelly, and then strained through flannel while hot. When this coating is dry, eight or ten more must be applied, consisting of the same size, mixed with fine plaster of Paris, or washed chalk, or powdered whiting; which mixture must be made by melting the size, and throwing the whiting, &c. gradually into it, stirring them well together, that they may be thoroughly incorporated. This is laid on with a stiff brush, and oftener or seldomer repeated, according to the nature of the work; for pieces of sculpture, seven or eight layers suffice: for flat, or smooth works, they use ten or twelve. In the latter case they are applied by drawing the brush or pencil over the work: in the former, by dabbing it smartly on, that the size may enter all the dents of the carving.

After the last coat is laid on, and before it be quite dry, a brush pencil, dipped in water, should be passed over the whole, to smooth it, and take away any inequalities that may have been formed; and when it is dry, the parts that admit of it should be again brushed over till they are perfectly even. The work should then be repaired, by freeing all the cavities from the priming: after which a water polish should be given to the parts designed to be burnished, by rubbing them gently with a fine linen rag moistened with water.

When the whole work is become quite dry, a moderately thick layer must be applied, composed of size and bole, or yellow ochre. Dossie, in the *Handmaid to the Arts*, gives the following recipe for the simplest compositions, used as the proper cement or gilding size in this kind of gilding: "Take any quantity of bole armeniac, and add some water to it, that it may soak till it grow soft. Levigate it then on the stone, but not with more water than will prevent its being of a stiff consistence, and add to it a little purified fuet or tallow scraped; and grind them together. When this is wanted for use, dilute it to the consistence of cream, by parchment or gloves' size, mixed with double its quantity of water, and made warm. Some melt the fuet or tallow, and mix it previously with five or six times its weight of chalk before it is put to the bole, to facilitate their commixture, to which in this wet state they are somewhat repugnant. It is also sometimes practised to put soap suds to the bole; which will contribute to its uniting with the tallow." (See *GOLD SIZE*.) Let this composition be diluted with warm size mixed with two-thirds of water, and let it be spread with a brush over the whole of the work, and then suffered to dry; and then let the same mixture be applied in the same manner, at least once more. After the last coat, it should be rubbed in the parts to be burnished with a soft cloth, till it be perfectly even. Some add a little vermilion to the gilding size, and others colour the work, if carved, before it be laid on, with yellow and the gloves' size; to which a little vermilion, or red lead, should be added. This last method is designed to give the appearance of gilding to the deeper and obscure parts of the carving, where the gold cannot, or is not thought necessary to be laid on. But this practice is much disused; and instead of it such parts of the work are coloured after gilding; which operation is called "Matting."

The work being thus prepared should be set in a position somewhat declining from the operator; who, having at hand a cup of clean water, and some hair pencils, moistens a part of the work, and then applies the gold leaf to the part so moistened in the manner already directed under the article *Oil-GILDING*, till it be completely covered, or till it be too dry to take the gold. This will immediately adhere on being pressed with the cotton ball. The operator proceeds

to moisten the next part of the work, and apply the gold as before, repeating the operation till the whole is completed. If, in examining the work, any parts should appear to need being repaired, they should be moistened as before, and covered with the gold; but care should be taken that no part be missed in the first operation, as it is not so easily mended as in oil-gilding: nor should any drops of water be suffered to fall on the perfect part of the gilding, as the gold is very apt to turn black in this state. The work being thus far gilt, when dry, and fit for the purpose, which it will usually be in about twenty-four hours, may be either to be burnished, or matted.

The proper period for this purpose can only be ascertained by experience, and varies at different seasons. The mode of distinguishing the fitness of the work to take the burnish, is to try two or three particular parts at a distance from each other; and if these take the polish well, the whole may be concluded to be in a fit state. But if the gold peel off, or be disordered by the rubbing, the work must be deemed not sufficiently dry; and if the gold bear the rubbing well, and yet receives the polish slowly, it is a proof of its being too dry, which should be prevented by watching the proper time. For the work, when too dry, both requires much more labour to burnish it, and fails at last of taking so fine a polish.

To burnish it, is to smooth and polish it with a lamisher, which is usually a dog's or wolf's tooth, or a blood-stone, an agate, or a pebble, or something else very smooth, fitted in a handle for that purpose.

To mat, is to give it a light lick in the places not burnished, with a pencil dipped in size, wherein a little vermilion sometimes has been mixed. This helps to preserve it, and prevent its flaking, when handled. Or, it is to cover the hollow parts with a colour the nearest in appearance to gold.

Some recommend for this purpose red lead, with a little vermilion ground with the white of an egg; but yellow ochre, or Dutch pink, with red lead, would better answer the end; or the *terra di Siena*, very slightly burnt, or mixed with a little red lead, would have a much better effect, and be more durable than any other mixture so near the colour of gold in shade. Ifinglass size will likewise supply the place of the whites of eggs. This operation of matting supercedes the necessity of yellowing, which is intended to give the appearance of gilding to the deeper and obscure parts of the carving where the gold cannot, nor is thought necessary to be laid on.

The last thing is to apply a vermeil, or lacquer, in all the little lines and cavities; and to stop and amend any little faults with shell-gold.

The composition here called *vermil*, is made of gum gutta, vermilion, and a little of some muddy brown colour, ground together with Venice varnish and oil of turpentine. Some gilders, in lieu of this, content themselves with the lacca, or dragon's-blood, with gum-water.

Sometimes, instead of burnishing the gold, they burnish the ground or composition laid on last before it; and content themselves afterwards to wash the part over with size. This method is chiefly practised for the hands, face, and other nudities in relief; which, by this means, do not appear so very brilliant as the parts burnished; though much more so than the parts perfectly flat, or matted.

To gild a work, and yet preserve white grounds, they apply a layer of Spanish white mixed with a weak fish-glue, or all the parts of the ground whereon the yellow, or the layer next under the gold, might run.

**GILDING**, *Japanners*, is performed by means of gold powder, or imitations of it, cemented to the ground by a kind of gold size: for the method of preparing which, see **GOLD-SIZES**. This kind of gilding may be practised on almost any substance whatever, whether wood, metal, leather, or paper; nor is there any preparation necessary, besides making the surface on which the size is to be laid, even, and perfectly clean. Then spread the japanner's size, mixed with a due proportion of oil of turpentine and vermillion, with a brush over the work, if the whole surface is to be gilt; or draw with it, by means of a pencil, the proper figure desired, avoiding carefully any other parts; when it is almost dry, so as to be capable, by its clamminess, of receiving the gold, dip a piece of wash-leather wrapped round the finger in the gold powder, described under *Shell-GOLD*, and rub it lightly over the sized work; or spread the powder with a soft camel's hair pencil; and with a camel's hair brush clear away the loose powder, after the gilded surface is dry. When leaf gold is used, the method of sizing must be the same as for the powders; but great care is necessary in laying them on, while the size is in a proper state of dryness.

There is a *false kind* of gilding, in which a colour of gold is given by painting and varnishes, without employing gold. Thus a very fine golden colour is given to brass and to silver, by applying on these metals a gold coloured varnish, which, being transparent, shews all the brilliancy of the metals underneath. Many ornaments of brass are varnished in this manner, which is called *gold lacquering*, to distinguish them from those that are really gilt. Silver leaves, thus varnished, are put upon leather, which is then called gilt leather; and many picture-frames have no other than this counterfeit gilding, which may be discovered by washing it with a little rectified spirit of wine; for the spirit will dissolve the varnish, and leave the silver leaf of its own whiteness. For plain picture frames, thick tin-foil may be used instead of silver; the tin leaf fixed on with glue is to be burnished, then polished with emery and a fine linen cloth, and afterwards with putty applied in the same manner; being then lacquered over with the varnish five or six times, it looks like burnished gold. (See **LACQUERING**.) Among the false gildings may also be reckoned those which are made with thin leaves of copper or brass, called *Dutch leaf*. In this manner are made all the kinds of what is called gilt paper. See **GILDING of Paper**.

**GILDING of Books**. There are various methods, with respect to the cement used, by which the edges of books or paper may be gilt. Strong gum-water or isinglass size, or glover's-size may be employed; but as the gum-water, and weaker sizes are apt to run beyond the edge, and thus cause the leaves to stick together, isinglass, melted with the addition of some common proof spirit of wine, and a sixth part of honey or sugar-candy is much to be preferred; to which must be added a third of bole armeniac well powdered.

The following composition may be used for this purpose: Take bole armeniac, and sugar-candy well powdered; mix them with the whites of eggs, beaten to an oily consistence; and the cement will be fit for use. In applying any of these cements, the paper, in quires or in books, should be well cut and polished on the edges to be gilt; and well screwed down by a press; in this state it is to be brushed over, first with a little of the cement without the sugar-candy or the bole; and when that is dry, either with the cement above given, or any other solution of gum or size with the proper proportion of the bole; after which it may be suffered to dry; and then water-polished, by rubbing it with a fine linen rag slightly moistened. It is then fit for receiving the gold, provided

it be moistened at that time; and the leaves may be then laid on, being cut according to the breadth which they are to cover, and pressed closely down by a cotton ball; and after the gilding is thoroughly dry and firm, it may be polished. See **BOOK-BINDING**, and **GILDING of Paper**.

**GILDING on china-ware**. The gold is very much valued on china-ware, and would be much more so, were it not that it is very liable to lose its lustre, and to rub off. The Chinese have at present a method of preventing both these accidents, in a great measure, by means of a sort of polishing, which they give it after it is laid on. They prepare for this purpose a fine piece of agate, which they polish on one surface in as perfect a manner as possible. With this they rub over the gold, as it lies on the porcelain, several times, when it first comes from the baking. This gives the gold a lustre which it would not otherwise have, and fixes it down to the ware in such a manner, that it cannot easily be got off. The principal mischief to which gold thus laid on is subject, is the tarnishing, or growing dull; this is remedied by the same sort of means. They wet the vessel, upon which they would revive the lustre of the gold, in common clean water; and while it is wet, they rub it with the same polished agate, adding a little fair water at times to keep it moist. If the gold has not been well laid on at first, this may possibly raise it or take it off in some places; but if it was originally put on with the help of this stone, as all the gold on porcelain now is, the rubbing it with it a second time never gives it any scratches, but recovers its pristine lustre and beauty. It must be observed, that the rubbing with this stone must be all done one way, both in the first laying on the gold, and in the brightening of it up afterwards. This may serve as a method for us as well as the Chinese, not only to recover the beauty of our tarnished gilt china-ware, but also to lay gold upon some of our home manufactures of this kind. *Observ. sur les Coutumes de l'Asie*. See **PORCELAIN**.

**GILDING on enamel and glass**, is performed by burning or annealing, *i. e.* by producing a cohesion of the gold with the glass or enamel, by the intermediation of a flux, or by producing the like effect without any. In both these methods, the gold is made to adhere to the enamel or glass, in consequence of the fusion or approach to that state, either of the flux used, or of the body of the enamel or glass itself, by which the gold is cemented to such body. The flux, when any is used, may be either simple glass of borax, or any of the preparations of fluxes powdered (see **FLUX**); and the gold is used, either in the form of leaf gold, or in that of powder made mechanically, or by precipitation. (See **GOLD powder**.) When leaf gold is employed without any flux, the enamel or glass may be moistened with a very weak solution of gum arabic, and again dried. After being thus prepared, it should be breathed upon till it becomes a little adhesive or sticky, and then laid upon a sufficient number of leaves of gold; when the gold is thus united to the enamel or glass by the cementing quality of the gum arabic, the work is ready for burning. If a flux be used, it should be finely levigated, tempered with a very weak solution of gum arabic, and very thinly spread on the part of the work to be gilded; and when the gum water is almost dry, the leaf gold should be laid on that part thus prepared for it, which is then in a state proper for burning. In the present practice, the *aurum fulminans*, or precipitation of gold by alkaline salts, is made by these who gild glass in the greatest perfection; and the volatile alkali is employed for the precipitation by the chemical, who prepares it for this purpose. But when this kind of precipitate is chosen, the use of any flux must be avoided, and a very considerable degree of heat

## GILDING.

heat applied. The manner of using the precipitate powders of gold, the *aurum fulminans* excepted, as well as the leaf gold, may be varied, by adding to it or omitting any flux; but in what way soever the powder is used, it is to be tempered with the oil of spike, and worked as the enamel colours; and the quantity of flux, when any is used, may be a third of the weight of the gold. In cases where the glass is very hard, or where the opportunity of a strong heat cannot be conveniently obtained, the expedient of using a flux in the following manner may be adopted with great advantage. Grind glass of borax to a fine powder; and having tempered it with oil of spike, lay it on the glass where the gilding is to be made; then burn the glass with a degree of heat, that will cause the borax to run; and when it is cold, apply the precipitate or leaf gold, and burn it again, as in other cases. After the work is burnt, if it be intended to be burnished, a proper lustre may be given to it, by rubbing the gilded part with a dog's tooth, or with a fine agate, or iron burnishers. *Handmaid to the Arts, vol. i. p. 374, &c. See Rub. GLASS.*

Gold may be laid upon white earthen-ware or glass, by drawing your design upon the vessel to be gilt, with japaners' gold size, moistening the size, as you find necessary, with oil of turpentine. Set the work in a clean place to dry for about an hour, and then place it so near the fire that you could but just bear the heat of it with your hand for a few seconds. Let it remain there till it feels quite tacky or clammy: then, having procured a cushion and some leaf-gold, cut it into slips of the proper size, and lay it on with a little cotton-wool. When the gold is all on, put the work into an oven to be baked for two or three hours.

Drinking glasses, with gilt edges, have been much admired in this country; the best of these are brought from Germany: those that are made in England, though equal in beauty to the foreign, being greatly inferior in the durability of the gilding. Dr Lewis made several experiments with a view of discovering this art; from which he concludes, that the gold is cemented to them by means of an intervening matter, which will adhere to glass so as not easily to be rubbed off. He tried malkich, and other resinous bodies rubbed warm on the glass, and several spirituous varnishes: but none of these were found to adhere sufficiently to the glass. He recommends to the trial of the artists in this way the harder oil varnishes: and glasses have been since prepared in England, probably on the principles which he has pointed out, with as durable gilding as those brought from Bohemia and Thuringia.

M Zeigler, in a German translation of the "Commercium Philosophico-Technicum," describes a varnish for this purpose, with the method of using it, which appeared from his experiments to be the best. This varnish is prepared by boiling fine transparent amber, reduced to powder, in a brass vessel, to the cover of which a valve is fitted, with as much drying oil as will just cover it; and by distilling the above solution with four or five times its quantity of oil of turpentine. This varnish may be made to dry sooner, and acquires greater firmness by grinding it with a little white lead, or rather with a mixture of white lead and minium. It is to be applied very thin on the glass, and the gold leaf laid lightly on the varnished part; when the varnish is thoroughly hardened, the gold may be burnished, by laying a piece of smooth paper between the tooth or steel burnisher, and the gold. This gilding, M. Zeigler observes, is durable, and of a fine lustre. *Com. Phil. Techn. p. 65, and 614.*

*GILDING of figures and letters on paper,* and for the embellishment of manuscripts, is performed with shell-gold, tem-

pered with gum-water; or the characters may be drawn with a milky solution of gum-ammoniacum made in water, and gold-leaf applied upon them when almost dry, or if all or any part of them is become quite dry, they may be again sufficiently moistened for receiving the gold by breathing on them. Letters raised from the surface of paper or parchment, in the manner of embossed work, such as are seen on ancient manuscripts, may be formed either by friction on a proper body with a solid piece of gold, or by leaf gold. The former method is practised by tempering pulverized crystal with strong gum-water, and with this paste forming the letters; when they are dry, they are rubbed with a piece of solid gold, as in polishing, and the letters will appear as if gilt with burnished gold. The letters are formed with an embossed figure, either of the separate letters, or of whole words, cut in steel; and each letter of these stamps, when they are used, is anointed evenly with a feather dipped in oil. Then fill these concave letters with the above paste, and strike the stamps in a perpendicular direction on the paper or vellum, laid over some sheets of paper.

When the embossed letters are formed with leaf gold, the following, or a similar composition must be used. Thicken beaten whites of eggs with as much vermilion as is necessary to give them the consistence of paste; use the stamps as before: and when the letters are dry, moisten them by a small pencil with strong gum-water; and when this is almost dry, cover the letters with leaf gold, pressing it close to every part of them with cotton or soft leather; after the gilding is dry, polish it with proper burnishers. *Com. Phil. Techn. p. 64 and Handmaid to the Arts, p. 452, &c.*

*GILDING of Lee-fish,* as craw-fish, carps, &c. may be performed without injuring the fish, by means of a cement; which Mr Hooke, in his posthumous papers, directs to be prepared in the following manner: Put some Burgundy pitch into a new earthen pot, and warm the vessel till it receives so much of the pitch as will stick round it; then strew some finely powdered amber over the pitch when growing cold; add a mixture of three pounds of linseed oil, and one of oil of turpentine: cover the vessel, and boil the contained ingredients over a gentle fire; grind the mixture as it is wanted, with so much pumice-stone in fine powder as will reduce it to the consistence of paint. When the fish has been wiped dry, this mixture is spread upon it, and the gold leaf laid over it, and gently pressed down; after which, the fish may be immediately put into water, and the cement will harden, and be in no danger of falling off.

*GILDING on leather.* See LACQUERING.

*GILDING of metals* may be done by cleaning the surface of the metal, and applying gold leaves to it, which, by means of rubbing with a polished blood-stone, and a certain degree of heat, are made to adhere perfectly well. In this manner silver leaf is fixed and burnished upon brass, in making French plate; and sometimes also gold leaf is burnished upon copper and upon iron. For this purpose, the metal, being previously polished and quite clean, is heated to about the temperature of melted lead, and covered with a double layer of gold leaf; then a blood-stone hammer, applied gently at first, and gradually increasing the pressure, will cause the surfaces of gold and copper to touch each other in almost every point, and then adhere with a force proportioned to the completeness of the contact. The first layer being thus burnished, a second is made to adhere in the same manner, and sometimes a third, if the gilding is intended to be very solid. This method of gilding is tedious, and is subject to the almost impossibility of using a sufficient pressure without injuring the evenness of the gilded surface. In cases where these objections do not apply, there cannot be a more effectual

effectual mode of gilding, as we perceive in the manufacture of gilt silver and copper wire. The bar, before it is committed to the wire-drawer, is plated with gold, by having several leaves of gold successively burnished down upon it, and being then subjected to the strong compression that takes place in wire-drawing, the gold and the other metal become so perfectly united, as to form, in a manner, one substance. See *GOLD Wire*.

Some metals, and particularly silver, may be gilt in the following manner: dip pieces of linen in the solution of gold by aqua regia, and then burn them to ashes; rub these ashes on the surface of the silver, well cleansed from any unctuous matter, with a wet linen rag, dipped in salt water; and the particles of gold contained in them will thus be applied to the silver, and adhere to it, without the application of heat, or intervention of any other body. Burnish the silver with a blood-stone, till it acquires the colour of gold. Moll gilt ornaments on fans, snuff-boxes, and other toys of much show and little value, are nothing but silver gilt in this manner. Beckmann (*Hist. of Inventions*, vol. i.) suggests, that this method of gilding, sometimes called dry, and sometimes cold gilding, is a German invention; and that foreigners, at least the English, were first made acquainted with it about the end of the 17th century; for Robert Southwell describes it in the *Phil. Transf.* for 1698, and says, that it was known to very few goldsmiths in Germany. See *GILDING of Metals by the fire*.

*GILDING on paper, parchment, and vellum.* There are various methods used for this purpose, according to the several ends which the gilding is designed to answer. But for the most part, size, properly so called, and gum-water, are used as the cements, and the powders are more generally employed than the leaf gold. See the three first articles in *GILDING*.

The gilding proper to be used with water-colours may be either with the leaf-gold or powder; the leaf-gold may be laid on the designed ground by means either of gum-water, or isinglass size; observing, that the gum-water or size be of the weaker kind, and laid sparingly on the ground, and that proper time be allowed for it to be dry; and then the gold is applied to it, as in the articles above recited; and it may be polished, if necessary, by the dog's tooth, or other kind of burnisher. In gilding larger surfaces, it will be found useful to colour the ground with the gall-stone; and when colours are to be laid on the gilding, the gall of any beast brushed over the gold will adapt it for receiving the colours. When the gold powders are used along with paintings in water-colours, they are previously formed into shell-gold. The gilding proper for the coloured paper used in binding books, and for other such purposes, is performed much in the same manner: only that the gum-water and size may be much stronger, and that they are generally conveyed to the ground by means of a wooden plate or print, or by an engraved roller, which make an impression of the intended figure or design. In this kind of gilding, the japanner's gold-size may be also commodiously employed; and this should be always used when the embossed appearance is wanted in the greatest degree; and for this purpose it should be thickened with yellow ochre, mixed with as much red-lead as the proper working of the print will admit. Instead of the genuine leaf-gold, or gold powder, the German powder, formed of the leaves called Dutch gold, is commonly used in this kind of gilding. The edges of books or paper are gilt in the manner directed under the article *BOOK-binding* and

*GILDING of books.*

*GILDING on Thread and Wire.* See *GOLD-thread*, and *GOLD-wire*.

*GILDING on Wood.* See the three first articles in *GILDING*.

*GILDING on Metals by the Fire.* There are two ways of gilding by fire; *viz.* that with liquid gold, and that with leaf gold. For the latter, see *GILDING of Metals*, supra.

The former, technically called "water-gilding," is performed with gold amalgamated with mercury, in the proportion of about six or eight parts of mercury to one of gold.

In order to this operation, they heat some pure quicksilver in a clean crucible, and, when it is nearly boiling, put about a sixth of its weight of fine gold in thin plates heated red-hot, and stir them gently about, till the gold be found melted and incorporated into a mass with the mercury. It is then allowed to cool; and when cold, it is to be put in a piece of soft leather; and by gradual pressure, the fluid part of the amalgam, consisting almost wholly of mercury, may be forced through the pores of the leather, while the gold, combined with about twice its weight of mercury, will remain behind, forming a yellowish silvery mass, of the consistence of soft butter. This, after having been bruised in a mortar, or shaken in a strong phial with repeated portions of salt and water, till the water ceases to be fouled by it, is fit for use, and may be kept for any length of time, without injury, in a corked phial. It is of indispensable importance that the materials of this amalgam should be perfectly pure; and therefore, the mercury employed in the preparation of it should be procured from the distillation of the red precipitate (nitrous red oxyd of mercury), either alone, or mixed with a little charcoal powder.

When silver is the metal to be gilt, it is prepared for the operation by soaking it in warm dilute muriatic acid, so that the surface may be rendered perfectly clean; it is next washed in clean water, which should be two or three times changed, in order to free it from the whole of the acid; and being afterwards dried, and made moderately warm, a little gold-amalgam, also warm, is to be evenly spread upon the silver, to which it will immediately adhere. In applying the amalgam, the operator uses a little knife, or a brush made of brass wire, for the purpose; and giving the work a gentle heat before the fire, he dabs or spreads the amalgam with the brush farther and more evenly upon it.

Thus far advanced, the metal is set over the fire, upon a grate, or in a sort of cage, under which is a pan of charcoal, yielding a heat just sufficient for evaporating the mercury; by which means the mercury is raised in fumes, and leaves the gold alone adhering to the work; in proportion as the mercury, evaporating and flying off, discovers places where gold is wanting, they take care to supply them, by adding new pieces of amalgam with the knife or brush.

If a thicker gilding be required than can result from so much of the amalgam as is applied at once, the metal, after the first quantity has left its gold fixed on the surface, has more of the amalgam spread upon it. After the evaporation of the mercury from this, another quantity may be applied in the same manner. When the mercury is evaporated, so that the surface becomes uniformly of a pale yellow colour, the metal is made to undergo other operations, by which its colour and lustre are heightened. For this purpose, it is first rubbed with a scratch brush, composed of fine brass wire, till its surface is made clean and smooth, but the pale yellow colour still remains; then it is covered over with a composition called gilding wax, and again exposed to the fire till the wax be burnt off; and this application is repeated till the gold appears of a proper colour. This gilding wax is composed of bees' wax, mixed with the following substances;

*viz.* red ochre, verdigris, green vitriol, or alum. Thus the colour of the gilding is heightened by a perfect dissipation of some mercury remaining after the former operation. The gilt surface is then covered over with a saline composition, consisting of equal quantities of nitre, sal ammoniac, green vitriol, and verdigris, finely powdered, and mixed up into a paste with water or urine; or, this is used instead of the gilding wax. The piece of metal thus covered is heated till the mixture smokes, and quenched in water or urine. This effect seems to be produced by the acid of nitre, which is disengaged by the vitriolic acid of the alum, or other vitriolic salt, during the exposure to heat, acting upon any particles of copper which may happen to lie on the gilded surface. If the colour of the gilding be not sufficiently heightened by the first application, a succeeding one will complete the desired effect. Some artists think they give an additional lustre to their gilt work, by dipping it in a liquor prepared by boiling some yellow materials, as sulphur, orpiment, or turmeric. The only advantage of this operation is, that a part of the yellow matter remains in some of the hollows of the carved work, in which the gilding is apt to be more imperfect, and to which it gives a rich and solid appearance.

Copper, and the alloys formed by its combinations with zinc, are gilded much in the same manner as silver; but their affinity for mercury being considerably less than that of silver, it is not easy to produce a complete adhesion of the amalgam of gold to the burnished surface of these metals by the same means, and with the same evenness as in the former case. Advantage is here taken of the nitric acid for facilitating the adhesion of the copper and mercury in the following manner. The piece of copper, *e. g.* a button, is first cleaned by steeping it in acid and subsequent washing, and it is then burnished in a lathe, or by other means; after this, it is dipped in a neutralized solution of nitrat of mercury, and in a few seconds, on account of the strong affinity of nitric acid for copper, the mercurial salt is decomposed. The copper takes the place of the mercury, and at the same time the mercury is deposited in the metallic state, on the surface of the copper, covering it entirely, and strongly adhering to it. The gold amalgam is now applied, and the rest of the process is the same with that which has been already described. Thus a given quantity of gold may be made to cover a larger surface than in any other way of gilding on metals; five grains of gold completely gilding both the upper and under surfaces of 144 copper buttons, each of them an inch in diameter. (Phil. Mag. ix. 20.)

Iron cannot be gilt by amalgamation, unless it be previously coated with copper, by dipping it in a solution of blue vitriol, or rubbed with the vitriol itself a little moistened. Iron may also receive a golden coat from a saturated solution of gold in aqua regia, mixed with spirit of wine; because the iron, having a greater affinity for the acid, precipitates the gold from it.

In the gilding of iron, or rather steel, by means of an amalgam, peculiar difficulties occur. If recourse be had to the method of simple burnishing down, the heat requisite for this purpose will, in many cases, bring the temper of the steel too low; on such occasions the mode already described of gilding copper is sometimes practised: that is, the parts of the steel to be gilded are pencilled over with nitrat of mercury, by which they are covered with a slightly adhering coating of mercury; then the amalgam is applied, and the gilding finished in the usual way. The objections to this process are, first, that a considerable heat is required, though inferior to that requisite for burnishing down; and, secondly, that even with all possible care, the gilding is apt to be rough and to scale off. A very

considerable improvement on this method is to trace the figure of the gilding on the steel first of all with a brush charged with a strong solution of sulphated copper, in consequence of which a pretty thick plate of this metal is deposited on the steel to which it may be made to adhere with considerable firmness by means of the burnisher; thus the gilding is, in part, performed upon the copper.

A new method of gold gilding upon steel has lately been published (see Phil. Mag. xi. p. 144), possessing many advantages over the others, and capable of ultimately attaining a very high degree of perfection. This method depends upon the well-known fact, that if sulphuric ether and nitro-muriat of gold are mixed together, the ether will, by degrees, separate from the acid nearly the whole of the gold, and retain it for some time in solution in nearly a metallic state. If ether, thus charged with gold, is spread, by means of a pen or fine brush, on the surface of highly polished steel, the ether presently evaporates, leaving the gold behind in close contact with the steel, and the adhesion is considerably improved by the subsequent application of the burnisher. The dearth, and especially the rapid volatility of ether, are objections of some moment, but may be got over by using the best oil of turpentine instead of the ether, which has nearly the same efficacy in decomposing the nitro-muriat of gold, and is both cheaper, and not so very quickly evaporable.

On the subject of gilding by amalgamation, Dr. Lewis has the following remarks: "There are two principal inconveniences in this business; one, that the workmen are exposed to the fumes of the mercury, and generally, sooner or later, have their health greatly impaired by them; the other, the loss of the mercury; for though part of it is said to be detained in the cavities made in the chimnies for that purpose, yet the greatest part of it is lost. From some trials I have made, it appeared that both these inconveniences, particularly the first and most considerable one, might be in a good measure avoided, by means of a furnace of a due construction."

If the communication of a furnace with its chimney, instead of being over the fire, is made under the grate, the ash-pit door, or other apertures beneath the grate, closed, and the mouth of the furnace left open, the current of air, which otherwise would have entered beneath, enters now at the top, and passing down through the grate to the chimney, carries with it completely both the vapour of the fuel, and the fumes of such matters as are placed upon it. The back part of the furnace should be raised a little higher above the fire than the fore-part, and an iron plate laid over it, that the air may enter only at the front, where the workman stands, who will be thus effectually secured from the fumes, and from being incommoded by the heat, and at the same time have full liberty of introducing, inspecting, and removing the work.

If such a furnace is made of strong forged (not milled) iron plate, it will be sufficiently durable. The upper end of the chimney may reach above a foot and a half higher than the level of the fire; over this is to be placed a larger tube, leaving an interval of an inch, or more, all round between it and the chimney, and reaching to the height of ten or twelve feet; the higher the better. The external air, passing up between the chimney and the outer pipe, prevents the latter from being much heated, so that the mercurial fumes will condense against its sides into running quicksilver, which falling down to the bottom, is there caught in a hollow rim, formed by turning inwards a portion of the lower part, and conveyed by a pipe at one side into a proper receiver.

Another method is mentioned by authors of gilding upon metals, and also upon earthen-ware and glass; which is, to fuse gold with regulus of antimony, to pulverize this mass,

and spread the powder upon the piece to be gilt; afterwards to expose it to such a fire that the regulus may be evaporated while the gold remains fixed. But Dr. Lewis mentions the following inconveniences to which this method is subject: the powder does not adhere to the piece, and cannot be equally spread; part of the gold is dissipated along with the regulus; glass is fusible with the heat necessary for the evaporation of regulus of antimony; and copper is liable to be corroded by the regulus, and to have its surface rendered uneven. Lewis's Com. Phil. Techn. p. 77, &c. p. 81. 88. and 108. Macquer's Dict. Chem. Eng. edit. 1777; and Aikin's Dict. of Chemistry, art. GILDING.

GILDING *Cushion*, is formed by a few folds of flannel, or a quantity of tow or wool, secured on a piece of wood of any size from eight to fourteen inches square by a light covering of leather, and fastened tight round the edges. The surface should be perfectly flat and even, and it is usually furnished with a handle. See CUSHION.

GILDING *Knife*, a slip of the hollow Spanish cane, cut up to a smooth and sharp edge, with a good penknife: this cane knife cuts the gold leaf better than one of steel, as it is apt to flick to this last. This knife may in all respects be the same as those used in painting, called "pallet knives;" the blade of which may be four or six inches long, and somewhat more than half an inch in breadth, with a proportionable handle.

GILDING *Pallet*, a flat piece of wood, about three inches long, and an inch broad, covered with a piece of fine woollen cloth.

By breathing upon this pallet, to moisten the cloth a little, and then clapping it gently down upon the gold leaf, this may be raised from the cushion, and conveyed to the work to be gilded.

GILDING *Tail*, a tool made by fastening the long hairs of a squirrel's tail between two cards, and used for taking up the gold leaf after it is cut, and applying it to the article to be gilded.

GILDING *Wax*. See GILDING of Metals.

GILDO, in *Biography*, a powerful lord in Mauritania, served the emperor Theodosius, in his brother's revolt in 373, with so much fidelity, that he was raised to the chief command in Africa. During the reigns of Arcadius and Honorius he maintained a kind of independence, and ruled, at his pleasure, the provinces under his command, which he oppressed by every species of tyranny. In the dissensions between the eastern and western empires, he was persuaded by the minister Eutropius to acknowledge Arcadius: for this he was condemned as a public enemy by the Roman senate. About the same time a deadly quarrel had arisen between Gildo and his younger brother Mascezel, in which the latter had taken refuge in the court of Honorius. Gildo, with a brutality that can never be sufficiently execrated, satiated his disappointed vengeance upon the two children of his brother, whom he barbarously murdered. Mascezel, anxious for revenge, landed a body of troops in Africa, and encamped in the face of a numerous army of Moors collected by Gildo. These, intimidated by the superior discipline of the Europeans, fled almost without a blow. Gildo escaped to the sea-shore, where he embarked for a foreign country, but, being driven back by adverse winds, he was seized by the inhabitants and thrown into a dungeon. There a voluntary death saved him from the cruel fate, which his conscience told him he might expect from his injured brother. The revolt of Gildo, says the historian, was considered as an event of so much importance to the empire, that the poet Claudian made the "Gildonic war" the subject of one of his panegyrics, to the honour of Stilicho, who was the commander in

it, against the subject of this article. Gibbon. Univer. Hill.

GILEAD, *Balm of*. See BALSAM.

GILEAD, *Falfe Balm of*, in *Botany*. See DRACOCEPHALUM.

GILEAD, in *Scripture Geography*, mountains of Palestine, which lay E. of Jordan, and separated the lands of Ammon, Moab, Reuben, Gad, and Manasseh from Arabia Deserta. According to Eusebius mount Gilead reached from Libanus northward to the kingdom of the Amorites, which was ceded to the tribe of Reuben; so that it must have extended above 70 leagues from north to south. This mountain, or rather chain of hills, was much celebrated for its excellent balm. Jer. viii. 22. xlv. 11. li. 8. Gen. xxxvii. 25. See BALSAM. Gilead derived its name from Gael-haed, *g. d.* the heap of witness, in reference to the heap of stones raised as a monument of the covenant between Jacob and Laban. Gen. xxxi. 21.

GILES, in *Biography*, a learned Italian prelate, and cardinal of the sixteenth century, distinguished himself by the progress which he made in different branches of literature; and was appointed professor of philosophy, and then of theology, in his order, that of the hermits of Augustine. In 1507, he was raised to the post of general of his order, and was employed by pope Julius II. to open the council assembled at the Lateran in the year 1512; and, in 1517, was sent legate into Germany by Leo X., on which occasion he was promoted to the office of cardinal. After this he was sent into Spain, and employed in many difficult negotiations. He was nominated bishop of several important sees at different periods, and also patriarch of Constantinople. He died at Rome in 1532, and left behind him a very high character for learning. He was, during his life, perpetually consulted in difficulties that occurred to the literati in the Oriental as well as the Latin and Greek languages. He was the author of many works that bear testimony to his reputation, among these are, Remarks on the early Chapters of the Book of Genesis, Commentaries on some of the Psalms of David; Dialogues, Epistles, Poems, &c. In the third volume of "Amplissima Collectio veterum Monumentorum," many letters of this prelate and his correspondents are inserted, which contain numerous facts as well relating to his own history, as to that of the period in which he flourished. Moreri.

GILFORD, in *Geography*, a small post and market town of the county of Down, Ireland. The river Bann runs through the centre of it, over which there is a very handsome bridge, highly ornamented with hewn stone, of twenty-two arches. It is a handsome neat town, and the country about it is highly improved; the houses are good, and chiefly inhabited by wealthy and reputable linen-drappers. The linen trade is carried on very extensively here, and the cloth is as remarkable for the fineness of its texture, as the river is for giving it an excellent bleach. Nothing can exceed in beauty the vale from Banbridge to Moyallen through Gilford, on the borders of the Bann, for a continuance of six miles; the river in delightful meanders, the rising grounds surrounding it adorned with woods, and the bottoms variegated with bleach-greens, afford views the most beautiful and picturesque. Gilford is 62 $\frac{1}{4}$  miles N. from Dublin, and 11 miles from Armagh.

GILGAL, in *Scripture Geography*, a celebrated place, W. of Jordan, where the Israelites encamped after their passage of this river, and where a considerable city, famous for many events, was afterwards built. It was about a league from Jordan and from Jericho.

GILGE, in *Geography*, a town of Prussia, in the circle of Samland;



Samland; 28 miles N.W. of Königsberg.—Also, a river of Prussia, which branches off from the Memel about 7 miles below Tiltit, and runs into the Curisch Haff, N. lat. 55° 10'. E. long. 21° 24'.

GILGEN, ST. a town of Austria, 10 miles N. W. of Efferding.—Also, a town of Stiria; 5 miles N.N.E. of Marburg.

GILGENEAU, a town of Prussia, in Oberland; 15 miles N.N.W. of Seldau.

GILGENBURG, a town of Prussia, in Oberland; 60 miles E. of Culm. N. lat. 53° 17'. E. long. 19° 57'.

GILGUL HAMMETHIN, a Hebrew phrase, literally signifying the *rolling of the dead*. To conceive the use of this expression it is to be observed, that the Jews have a tradition that, at the coming of the Messiah, no Israelite shall rise any where but in the Holy Land. What, then, shall become of all the faithful interred in other parts? Shall they perish, and remain in the state of death?

No, say the Jewish doctors; but God will dig them subterraneous canals, or cavities, through which they shall roll from their tombs to the Holy Land; and, when they are arrived there, God will blow on them, and raise them again.

This imaginary passage of the carcases, or ashes, of the Jews from their tombs to the Holy Land, by rolling underground, is what they call *gilgul hamethin*, the rolling of the dead.

GILBERTIA, in *Botany*, named by Prof. Gmelin of Göttingen in his faulty edition of the *Syst. Nat. of Linnæus*, v. 2. 682, in honour of John Emanuel Gilbert, author of a *Flora Lithuanica*, printed in 1781, octavo, which was suppressed by authority of the government of Poland, on account of its alleged imperfections, but which was reprinted by its author afterwards at Lyons, where he also edited various works of Linnæus.—Willd. *Sp. Pl.* v. 2. 551. (*Quivisia*; Cavan. *Diff.* 367. *Juss.* 264. *Lamarc.* *Illustr.* t. 302.)—Class and order, *Decandria Monogynia*. Nat. Ord. *Tribilata*, Linn. *Meliæ*, Juss.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, bell-shaped, with four or five teeth, permanent. *Cor.* Petals four or five, ovate, obtuse. Nectary of one leaf, cup-shaped, shorter than the petals, embracing the germen, with ten marginal teeth. *Stam.* Filaments none; anthers eight or ten, ovate, erect, sessile on the teeth of the nectary. *Pist.* Germen superior, globose, furrowed, shorter than the nectary; style simple, rising above the nectary; stigma globose, thick, furrowed. *Peric.* Capsule ovate, coriaceous, splitting half way down into four acute recurved valves, with longitudinal central partitions, separating it into four cells. *Seeds* one or two in each cell, ovate, smooth, affixed to the columella.

Ess. Ch. Calyx with four or five teeth. Petals four or five. Nectary cup-shaped, bearing the anthers on its margin. Capsule ovate, of four cells. Seeds mostly solitary.

1. *G. decandra*. (*Quivisia decandra*; Cav. n. 531. t. 211.)—Leaves alternate, elliptic-lanceolate, undivided. Flowers five-cleft, decandrous, racemose.—Gathered by Commerçon in the island of Mauritius. An evergreen shrub, with numerous, alternate, zig-zag branches. Leaves alternate, stalked, an inch or inch and half long, elliptic-lanceolate, entire, more or less acute, smooth, with one rib and many transverse veins, without stipulas. Flowers from five to nine in each axillary cluster, with downy stalks and calyx. Petals white, elliptical, thrice as long as the calyx, silky at the back, each about a quarter of an inch in length. Nectary white, about half as long. The habit of the shrub and aspect of the flowers, resemble a *Linonia*.

2. *G. heterophylla*. (*Quivisia ovata*; Cav. n. 532. t. 212; and *Qu. heterophylla*; n. 533. t. 213.)—Leaves obovate; undivided, sinuated, or pinnatifid. Flowers four-cleft, octandrous, somewhat umbellate.—Gathered by Commerçon in the islands of Bourbon and Mauritius. The leaves rather smaller than in the last, and remarkable for their variety of shapes, being either obovate and blunt, or somewhat pointed, and either undivided, or more or less slightly waved or sinuated, or deeply and accurately pinnatifid like an oak-leaf; all these varieties are found on the same specimens, nor can we separate *Quivisia ovata*, though all the leaves of one plant happened to be undivided, for the original specimens accord in every other particular. The flowers are much smaller than in the first species, and grow from two to four together in rather an umbel, than a cluster. Capsule the size of a pea, pointed, slightly silky.

3. *G. oppositifolia*. (*Quivisia oppositifolia*; Cav. n. 534. t. 214.)—Leaves opposite, elliptical, undivided. Flowers somewhat umbellate.—Native of the Mauritius. Leaves broadly elliptical, obtuse, uniform, two inches long, all nearly opposite, as well as the branches. We have not seen the flowers. The fruit is rather umbellate than racemose, the size of a large pea, furrowed, depressed, clothed with shining tawny down, and opening into four or five parts on the same branch.

4. *G. rutilans*.—Leaves alternate, ovate, pointed, undivided. Flowers somewhat racemose.—Gathered by Commerçon in the Mauritius with the former, but not described by Cavanilles or Willdenow. The leaves are almost as large as the last, but more pointed, often oblique, and always alternate. Branches zig-zag. Clusters short, racemose, though appearing like little umbels, about the length of the footstalks, each of from three to six flowers, their stalks very slightly downy. Petals silky at the back, a line long. Fruit of four cells, globose, four-furrowed, the size of a pea, clothed with short, dense, rigid, golden-coloured pubescence.

Commerçon, the only Botanist who has gathered any species of this genus, seems to have intended naming the decandrous ones *Baretia*, and the octandrous *Ababellia*, but they cannot be separated on any botanical principle whatever. All go by the name of *Bois de Quivi* among the French in the islands of Mauritius and Bourbon, whence Cavanilles contrived his barbarous name *Quivisia*. Of their qualities or uses nothing is mentioned. The names of *Baretia* and *Ababellia* were both intended to commemorate a young woman, who, being desirous of sailing round the world, put on men's cloaths, and engaged herself as a sailor, her real sex being concealed from all on board, except Commerçon, to whom she devoted herself, passing as his servant. At length, on the arrival of the ship at Ouluaité, the more intelligent natives discovered the secret, which had escaped the penetration of her companions, to their no small punishment. Commerçon contrived the word *longifolia* as a specific name, to express her fidelity. The Orabitians, had they understood Latin, would probably have invented a better.

GILMER, or GERMAR, in *Biography*, last king of the Vandals in Africa, a descendant of Genseric, succeeded to the throne of his deposed cousin Hilderic. The emperor Justinian joined the cause of the deposed sovereign, and determined to annex the African provinces once more to the Roman dominions. Belisarius was chosen to execute the design, who failed in 533. Zeno, the brother of Genser, was, at this time, engaged in the conquest of Sardina, by which circumstance the force of the Vandals was divided, while a considerable party at home still adhered to the late king Hilderic. Gilmer assembled his troops to resist the invader, but being defeated with great slaughter he was glad to re-

ture to the Numidian deserts, having first exercised the tyrant's policy, by commanding the execution of Hilderic and his captive friends. Carthage submitted to the victorious Belisarius; but Gilimer collected his scattered forces, and being joined by Zano, who had returned from Sardinia, a second action ensued, in which Zano lost his life, and Gilimer again retreated. The loss of the African provinces succeeded, and the de-feated king was forced to take refuge in the inaccessible mountains of the interior of Numidia. Even here, he was surrounded by a part of the Roman army under Pharus, and reduced to the utmost distress, which to him was peculiarly afflictive by its contrast with the luxury and effeminacy in which he had been accustomed to live. So deplorable was his situation, that he is reported to have applied to Pharus for a lyre, a sponge, and a loaf of bread: the first he laid was to sooth his sorrows; the second to dry up his tears: the third he asked as an humble delicacy, of which he had not tasted for a long time. His distresses at length obliged him to submit to the conqueror; he descended from the mountains, and followed Belisarius to Constantinople, marching in the train of his triumph; on which occasion, he suffered neither tear nor sigh to escape, but frequently exclaimed, in the language of Solomon, "Vanity of vanities, all is vanity!" The emperor received him with respect, and shewed him much attention and kindness: he would have raised the fallen monarch to the dignity of patrician, could he have been persuaded to renounce the Arian doctrine, in which he had been educated. He was put in possession of a large estate in Galatia, where, in the bosom of his family, he ended his days in peace. The extinction of the Vandal kingdom in the person of Gilimer is to be dated from the year 534. Gibbon. Univer. Hist.

**GILION**, in *Geography*, an island in the East-Indian sea, about 36 miles in circumference. S. lat. 7° 6'. E. long. 114° 37'.

**GILIS**, *Str.*, a town of France, in the department of the Scheldt, and chief place of a canton, in the district of Termonde. The place contains 3228, and the canton 16,770 inhabitants, on a territory of 95 kilometres, in six communes.

**GILITZSTAIN**, a town of the duchy of Carinthia; 10 miles E.N.E. of St. Veit.

**GILL**, in *Agriculture*, a term sometimes applied provincially to the pair of wheels and frame on which timber is conveyed.

**GILL, JOHN**, in *Biography*, was born at Kettering, in Northamptonshire, in 1697, and discovering, when very young, an uncommon capacity for learning, his father, who was a dissentor of the Baptist persuasion, sent him to a grammar-school in the neighbourhood, where he soon outstript his companions in classical attainments. When he was but eleven years of age he had read several of the common school books in Latin, and made a considerable proficiency in the Greek. Owing to the narrow circumstances of his parents he was put to business, but he did not fail to improve his leisure moments by an attention to classical literature, so that by the time when he had attained his nineteenth year he had read all the Greek and Latin authors that had fallen in his way, and had diligently studied logic, rhetoric, moral and natural philosophy. He had likewise studied Hebrew so as to be able to read the Old Testament in the original with pleasure. In 1716 he was baptized, and soon after commenced preaching in private. He now removed to Higham Ferrers to prosecute a regular course of studies under Mr. Davis, a man of considerable learning, and pastor of a baptist church in that place. His stay here was short, and after about a year he returned to his native town,

and became assistant preacher to the congregation there; and in 1719 he received and accepted an invitation to become pastor of a baptist congregation in Southwark. The duties of this situation he discharged with great fidelity and usefulness more than half a century. He died in 1771 in the seventy-fourth year of his age. His sentiments in religion were strictly Calvinistic; and his moral conduct was unimpeachable and truly exemplary. He was author of many works, particularly of "An Exposition of the Old and New Testament;" in nine volumes folio: "A body of Divinity," in three volumes 4to.; "A Supplement to Mr. Whiston's Essay towards restoring the true text of the Old Testament." In the year 1748, when he had published the third volume of his "Exposition of the New Testament," the degree of doctor of divinity was conferred upon him by the university of Aberdeen without his solicitation or knowledge: information of the fact was communicated to him by two of the learned professors, who declared that his diploma was presented to him, "on account of his great knowledge of the scriptures, of the oriental languages, and of Jewish antiquities, of his learned defence of the scriptures against Deists and infidels, and the reputation gained by his other works." Dr. Gill had, indeed, from the time of his settling in the metropolis, paid a most unwearied attention to the oriental languages: he had studied the writings of the fathers, ecclesiastical history, the accounts of the rites and customs of the eastern nations, all which he knew were adapted to enrich his stores of biblical learning, and to qualify him for the duties of his profession. Gen. Biog.

**GILL**, in *Botany*. See **GLECHOMA**.

**GILL**, in *Geography*, a township of America, in the state of Massachusetts and county of Hampshire, situated on the W. bank of Connecticut river, 90 miles from Boston; containing 700 inhabitants.

**GILL**, or *Beck*, is a name in several English counties for a brook, rivulet, or small stream of water.

**GILL**, a measure of ale or beer, is 1-4th of an ale pint = 8.8125 cubic English inches = 1.220779 wine gills = .0169084 cubic links.

**GILL** of wine, cyder, oil, &c. = 1-4th of a wine pint = 7.21875 cubic English inches = .8191490 ale gills = .0145307 cubic links.

**GILL**, Scotch measure, = 1-4th of a mitchkin = 1-16th of a Scotch pint, the cubic content of which varies much in different places. See *Scotch PINT*.

**GILLAROO, TROUT**. See *TROUT*.

**GILLEM'S BAY**, in *Geography*, a bay on the S. coast of the island of St. Christopher; two miles W. of Basseterre.

**GILLE-LE-VICOMTE, ST**, a town of France, in the department of the North Coasts; six miles N.N.E. of Guingamp.

**GILLES-LES-BOUCHERIES, ST**, a town of France, in the department of the Gard, and chief place of a canton, in the district of Nimes; 10 miles S.S.E. of Nimes. The place contains 5374, and the canton 6557 inhabitants, on a territory of 180 kilometres, in two communes.

**GILLES-SUR-VIC, ST**, a town of France, in the department of the Vendée, and chief place of a canton, in the district of Les Sables-d'Olonne; 13 miles N.N.W. of this latter town. The place contains 780, and the canton 12,335 inhabitants, on a territory of 432½ kilometres, in 17 communes.

**GILLES, PETER**, in *Biography*, was born at Albi in 1490, and became distinguished as a scholar and traveller. Having acquired an extensive knowledge of the learned languages

guages and the philosophy of the times, he set out on his travels with a view of making observations in natural history and antiquities. On his return he was introduced to the notice of George d'Armagnac, bishop of Rhodes, who engaged him to compose his book "De Viet Natura Animalium." This work, which consisted of extracts from Aelian and others, with observations of his own, he dedicated to Francis I., who sent him to travel in the Levant, but without furnishing him with proper supplies, so that he was reduced to great distress, and was obliged to enlist in the troops of the sultan Soliman II. for subsistence. He left Constantinople in 1550 and went to Rome, where he died 1555. He was author of two geographical works, "De Bosphoro Thracio," and "De Topographia Constantinopoleos," which are esteemed for their learning; and also of some translations from the Greek. *Moreri.*

GILLESAY, or GILLSAY, in *Geography*, one of the smaller Hebrides, between Lewis and North Uist. N. lat. 57 45'. W. long. 6 59'.

GILLESAY Point, a cape on the S.W. coast of the island of Celebes. S. lat. 5 15'. E. long. 119 43'.

GILLESKAAL, a town of Norway, in the diocese of Drontheim; 240 miles N. of Drontheim.

GILLETTE, a town of France, in the department of the Maritime Alps, and chief place of a canton, in the district of Puget-Theniers. The place contains 646, and the canton 1712 inhabitants, on a territory of 105 kilometres, in four communes.

GILLIAN, GUISLAIN, or *Ghislain*, St, a town of France, in the department of Jemmappe, situated on the river Haisne and surrounded by marshes, and deriving its name from a celebrated abbey founded in the year 651 by Guislain, the friend of St. Amand. Having been successively in the possession of the Dutch, the French, and the Spaniards, and of the allies, it was taken by the French in 1792. St. Gillian was called the key of Mons, and is distant three miles W. of it.

GILLIFREE. See JULIFREE.

GILLINGHAM, a parish in the hundred of Chatham and Gillingham, Kent, England; is seated on the river Medway at the distance of two miles from the town of Chatham, and 32 from London. It contains 715 houses and 4133 inhabitants, the greater part of whom are immediately or indirectly employed in the business connected with the neighbouring dock-yards. This village, though now deprived of its consequence by the increase of Chatham, was formerly of much note. In the time of queen Elizabeth here were four quays, and twenty-seven ships and boats; the largest of these, however, was only twenty tons. The archbishops of Canterbury formerly had a palace here; one of whom, John Strafford, in the tenth year of Edward III's reign, obtained a charter for a weekly market, and an annual fair to continue eight days; but these have been long discontinued. William of Gillingham was a native of this place. He was a monk of Canterbury, in the time of king Richard II., and wrote a history of Britain; also one of his own monastery. *Hatted's History of Kent*, vol. iv. 8vo.

GILLORI, an island on the coast of West Florida, divided from Dauphin island by a very narrow channel, through which a boat cannot pass without some difficulty; and between Gillori and the main land, on the west side of Mobile bay, there is a chain of small islands and oyster shells, through which is a passage of four feet, called "Passé au Héron."

GILLS, BRANCHIÆ, in *Ichthyology*. See FISH, *Organs of Respiration*.

GILLS, *Leaf of the*. See FOLIUM *branchiarum*.

GILLY-FLOWER, in *Gardening*, the common name of a fine fragrant flowery plant, common in gardens, &c. See DIANTHUS.

GILLY-FLOWER, *Queen's*. See HESPERIS.

GILLY-FLOWER, *Stork*. See CHEIRANTHUS.

GILLY-Lough, in *Geography*, a lake of Ireland, in the county of Sligo; and on the river by which its waters are discharged into the sea stands the town of Sligo. This lake exhibits that variety of charming prospects which bold hills, wooded lawns, and large islands clothed with verdure and crowned with trees, united with a great extent of water, cannot fail to produce. *Beaufort.*

GILMANTOWN, a post-town of America, in Strafford county, New Hampshire, S.W. of lake Winnipicogee, and 52 miles N.W. of Portsmouth; incorporated in 1727, and containing 3752 inhabitants.

GILMARQUEY, a town of Hindoostan, in Dowlatabad; 13 miles N.E. of Nander.

GILOH, or GELO, in *Scripture Geography*, a town of Palestine, situated in the mountains of the tribe of Judah. *Josh. xv. 51.*

GILOLO, in *Geography*, one of the Molucca island, in the East-India ocean, of considerable extent, and in its irregular form resembling *Celbes*, which see. Its length is about 230 British miles, and the breadth of each limb seldom above 40. The shores are low; but the interior rises to high peaks, perhaps of granite. This island is said to have been once governed by one sovereign, a sultan from Mecca; but the sultans of Ternate and Tidore now seem to share it between them, the former possessing the northern part with Mortay, Bakian, Motir, and some Celebesian islands, and part of Papua; while the sultan of Tidore holds the southern part with Myfol, and some other isles. One of the chief towns is Tatanay, situated on a point or promontory of the eastern limb, faced with precipices, so as to be accessible only by ladders. Gilolo abounds with oxen, buffaloes, goats, deer, and wild hogs; but the sheep are few. The bread-fruit and sago-tree are common; and, in spite of the Dutch extermination, there are probably cloves and nutmegs. The natives are industrious, particularly in weaving; but their exertions are suppressed by Batavian jealousy. The equinoctial runs through the southern part of the island. *E. long. 128°.*

GILP LOCH, in Argyleshire, Scotland, is a kind of gulf branching from Loch Fine on its W. side, which is navigable for vessels to the entrance of the Crinan canal, through which they pass to Loch Crinan, and the Irish sea. See CANAL.

GILPIN, BERNARD, in *Biography*, was born at Kentmire, in Westmoreland, in the year 1517. He was destined by his parents for the church, and educated with that view. At sixteen years of age he was entered at Queen's college, Oxford, where he became distinguished for the diligence with which he applied to his academical studies. He was led to think for himself, and freely, by the writings of Erasmus; and as he determined to apply himself to the study of the logic, he set about acquiring a thorough knowledge of the Greek and Hebrew languages, in order that he might investigate the scriptures in their original tongues. In 1539 he took his degree of B.A., and in 1541 that of M.A., and about the same time he was elected fellow of his college, and admitted into holy orders. Shortly after he was invited to become a member of cardinal Wolsey's new foundation at Christ-church, which he accepted. Here he continued his former studies, but it does not appear that his course of reading had produced any doubts in his mind respecting the

the popular religion, for he even entered into a vindication of the Catholic doctrines in a dispute with Hooper, afterwards Bishop of Winchester. The discussion was however favourable to his improvement and candour, as it afforded him the opportunity of discovering that his own opinions were not so well supported by scripture as he imagined. Upon the accession of Edward VI., Peter Martyr was sent, under the patronage of that prince, to Oxford to read divinity lectures, a duty which he performed in a strain to which that university had been but little accustomed. He attacked many established doctrines, which had been long regarded as the truth, and the only truth. Gilpin was looked up to, as capable of defending the established doctrines in opposition to modern innovations, but his faith was shaken, and he chose to remain an unprejudiced spectator, ready to embrace whatever should appear the truth, after deliberately weighing the arguments which the discussion might provoke. At length, however, he consented to enter the lists with Peter, and the dispute ended in the conviction of Gilpin that there were great corruptions in popery, and that there was need of a total reformation. He continued at Oxford till he was thirty-five, and took his bachelor's degree in divinity. In 1552 he was presented with a living in Durham, but before he went to reside there, he was appointed to preach before his majesty at Greenwich. The king was not present, but Gilpin's discourse was a serious and very hostile attack on the prevailing avarice and corruption of the age; he spared neither the court, clergy, magistrates, nor gentry. The freedom which he made use of at this time recommended him to the notice of many persons of the first rank, particularly of sir William Cecil, afterwards lord Burleigh, who obtained for him a general licence for preaching. While Mr. Gilpin was in London, he frequently visited his uncle Tonstal, bishop of Durham, at that time a prisoner in the Tower, under a sentence of misprision of treason. When Mr. Gilpin was settled in the country, he felt many doubts how to proceed in the instruction of his people; he had not made up his own mind on many important doctrines, and therefore felt but ill qualified to teach others, or indeed to guard them from the prevailing errors. He accordingly resigned his living, and determined, at the advice of Tonstal, to spend some time abroad. He had now an opportunity of re-examining all his opinions; he began to have just notions of the doctrines of the reformed; saw things in a clearer light, and felt a satisfaction in the change that he had made, to which he had hitherto been a stranger. On the death of king Edward, Tonstal was released and reinstated in his bishopric; he immediately offered his nephew a good living, which was respectfully refused on conscientious principles. He returned from the continent in the year 1556, and immediately visited bishop Tonstal, who received him with great friendship, and presented him with the archdeaconry of Durham, to which he annexed the living of Easington. He now repaired to his parish, determined to do what good he was able in reproving vice, and encouraging virtue. His zeal and assiduity in the good work of reformation made him many enemies, and the cry of heresy was continually sounded against him, but by the skilful management of his uncle, the charge, though formally and publicly brought, was dismissed. After this, he resigned his preferment in the church, and became domestic chaplain to the bishop. Mr. Gilpin did not remain long without a benefice, but was inducted to the living of Houghton-le-Spring, and upon his arrival at the place, people crowded to him from all quarters, perceiving that he was a teacher very different from those to whom they had been accustomed, and by his truly affectionate treatment of them, he quickly gained their confidence, respect, and

attachment. The bishop was still anxious for the advancement of his nephew, and presented to him a vacant prebend in the cathedral of Durham, which Mr. Gilpin modestly, but firmly declined, and told the prelate, "that by his bounty he had already more wealth than, he was afraid, he could give a good account of, and he hoped his lordship would rather bestow this preferment on one by whom it was more wanted." A fresh set of articles of impeachment were drawn up and presented against him, and he was again protected by his uncle, but from this period the bishop's favour to him manifestly declined, and he struck him out of his will. He was exceedingly concerned to have in any way offended so good a benefactor, but he could not compromise the matter; he was bound to satisfy his conscience, and Tonstal was vexed that he should carry his piety and zeal to what he thought an excess. The malice of Mr. Gilpin's enemies was not satisfied with the loss which he had experienced in his uncle's esteem; they accused him before the savage Bonner, who, in the moment of his frantic zeal, declared that he would bring him to the stake in a fortnight. Gilpin refused to listen to the entreaties and intercessions of his friends by leaving the country, but was prepared to suffer for the truth, as he had been zealous in propagating it. He accordingly waited with great composure for the arrival of the bishop's messengers. He was apprehended, but fortunately, before he could reach London, an account of the Queen's death met them on the road, an event not more favourable to our worthy pastor, than important for the country at large. The merciless savage might now gnash his teeth, but he could no longer inflict the venom of his malignity upon the unoffending reformers. Gilpin, thus almost miraculously delivered, returned to Houghton through crowds of people, who regarded him as a father, and who expressed their utmost joy, and offered up their thanks to Almighty God for his deliverance. Mr. Gilpin was soon nominated to the bishopric of Carlisle, which he declined, giving as a reason, that in this diocese he had many friends and acquaintances, of whom he did not think very highly, and that he must connive at many irregularities, or draw upon himself so much hatred as to prevent his usefulness. In 1561 he was offered the provostship of Queen's college, Oxford, which he likewise declined; contenting himself with the living of Houghton, the duties of which he performed in the most exemplary manner. He employed much of his time in endeavouring to improve the minds of the younger part of his parish, suffering none to grow up in an ignorance of their duty, but urging all to intermix religion with labour, and amidst the cares of this life to have a constant regard to the next. He was assiduous in preventing lawsuits among his parishioners, and his hall was frequently thronged with people of his own or neighbouring parishes, who came to settle their differences. He had a tender concern for all under affliction, and was a much readier visitant at the house of mourning than at the house of feasting. To strangers and travellers there was always a generous welcome at the house of Mr. Gilpin, and he could suit himself to persons of all ranks in life. Once he received an unexpected visit from lord Burleigh, and the reception of the noble stranger was so liberal, that his lordship was accustomed to say, that he could not have expected more at Lambeth. When the great statesman left his host, and had travelled about a mile from his residence, he turned his horse to take one more view of the place in which he had experienced so much content, and having kept his eye fixed some time, he exclaimed, "There is the enjoyment of life, indeed! Who can blame that man for not accepting a bishopric! What does he want, or what can he possess to make him greater

or happier, or more useful to mankind." Mr. Gilpin's labours extended beyond his own parish; he every year visited divers neglected parishes in Northumberland, Yorkshire, Cheshire, Westmoreland, and Cumberland; and that his own flock might not suffer, he was at the expence of a constant assistant. In all his journeys he did not fail to visit the gaols and places of confinement; and by his labours and affectionate manner of behaviour, he is said to have reformed many abandoned persons in those abodes of human misery. He had set places and times for preaching in the different parts of the country, which were as regularly attended as the assize towns of a circuit. If he came to a place in which there was a church, he made use of it; if not, of barns, or any other large building, where great crowds of persons were sure to attend him, some for his instructions, more, perhaps, to partake of his bounty; but in his discourses he had a sort of enthusiastic warmth, which roused many to a sense of religion who had never thought of any thing serious before. The dangers and fatigues attending this employment were, in his estimation, abundantly compensated by the advantages which he hoped would accrue from them to his unimpaired fellow-creature. He did not spare the rich; and in a discourse before the bishop of Durham, who had already conceived a prejudice against him, he spoke with so much freedom, that his best friends dreaded the result; they rebuked him for giving the prelate a handle against him, to which he replied, "If the discourse should do the good he intended by it, he was regardless of the consequences to himself." He then waited on the prelate, who said, "Sir, I propose to wait upon you home myself." When they arrived at the rectory, and entered the house, the bishop turned suddenly round, and grasped him eagerly by the hand, saying, "Father Gilpin, I know you are fitter to be bishop of Durham, than I am to be parson of this church of yours. I ask forgiveness for past injuries. Forgive me, father, I know you have enemies, but while I live bishop of Durham, none of them shall cause you any further trouble." Upon queen Elizabeth's recommending the establishment of free-schools, Mr. Gilpin undertook to build and endow one, a design which he immediately put in execution. This school was no sooner opened than it began to flourish; and there was so great a resort of young people to it, that in a little time the town was scarcely able to accommodate them. He procured able masters from Oxford, and took every method to encourage those of his pupils who were most diligent in their studies. In the latter part of his life Mr. Gilpin went through his various duties with much difficulty; his health was impaired, and his constitution broken down by the great fatigues which he had undergone for many years. In addition to his infirmities, he met with an accident which had nearly proved fatal to him, and from the effects of which he never perfectly recovered. As he was crossing the market-place at Durham, he was thrown down, and almost trampled to death by an ox. After a long and tedious confinement, he was able to get out, but continued lame as long as he lived. He died in 1583, in the 66th year of his age. Such were the life and labours of Bernard Gilpin, who, for his exemplary piety, laborious virtue, and unbounded benevolence, deserves to have his name transmitted to posterity with respect and reverence, and who obtained, and most deservedly among his contemporaries, the title of the Northern Apostle. By his unwearied application he had amassed a great stock of knowledge, and was indeed ignorant of no part of learning at that time in esteem. He had given more than common attention to the study of the dead languages, to history and divinity; he is said to have excelled in poetry, but he ex-

pended little time in the pursuit of any thing that was foreign to his profession. His temper was naturally warm, but, by degrees, he succeeded in obtaining an entire command of himself. His disposition was serious, yet, among his particular friends, he was cheerful and even facetious. His severity had no other object but himself; to others, he was mild, candid, and indulgent. *Biog. Brit.*

GILPIN, SAWNEY, who lately practised horse painting with so much success, was born at Carlisle in 1733, from whence, after having acquired some relish for the art from his father, who was a captain in the army, he came to London, and was articled to a ship-painter. His first interesting work, were composed of some market groups which struck his eye from his window. Soon after he went to Newmarket, being encouraged by the late William, duke of Cumberland, where he executed many compositions which might have vied with Hogarth in point of character. In the duke's stud he acquired that knowledge of the horse, which he has displayed with such superior spirit and beauty, and when we see with what felicity he applied it to the higher departments of the art, to historic compositions in the triumph of Camillus, the election of Darius, the story of Phœtor, we must lament that such talents should have been drawn aside to the meaner employment of horse-portrait-painting, which occupied too much of his valuable life.

His drawings of animals, in pencil and water-colour, display a degree of taste and skill seldom attained. As a man he was equally esteemed for probity of character and simplicity of manner, and, as a member of the Royal Academy, he added honour to the institution. *Fuseli's Pilkington.*

GILSON, in *Geography*, a township of America, in Cheshire county, New Hampshire, containing 484 inhabitants; situated on the E. side of Ashuelot river, and joining Keene on the south.

GILT, in *Rural Economy*, a term signifying a young female pig, whether in an open or spayed state.

GILT-Head, in *Ichthyology*. See *AURATA* and *SPARUS*.

GIMAR, in *Geography*, a town of the island of Cuba; 6 miles E. of Havannah.

GIMBLET, in *Carpentry*, a small boring tool, which enters the wood with a screw; the part above is cylindrical, both inside and out: its use is to make a way for nails, in order to drive more easily, or to prevent the wood from splitting.

GIMBLETING, in *Sea Language*, is applied to the anchor, to denote the action of turning it round by the stock, so that the motion of the stock appears similar to that of the handle of a gimblet, when it is employed to turn the wire.

GIMBOLS, denote the brass-rings by which the sea-compass is suspended in its box that usually stands in the binacle.

GIMESCH, in *Geography*, a town and castle of Hungary; 10 miles W. of Bukans.

GIMIGLIANO, a town of Naples, in Calabria Ultra; 10 miles E. of Nicastro.

GIMMER, a town of Africa, in Dar-für; 40 miles N.N.W. of Cobbé.

GIMMER Hog, in *Rural Economy*, a name applied to a female sheep of the first year.

GIMMER Lamb, a term applied to a female lamb.

GIMONT, in *Geography*, a town of France, in the department of the Gers, and chief place of a canton, in the district of Auch; 12 miles E. of Auch. The place contains 2300, and the canton 8413 inhabitants, on a territory of 230 kilometres, in 13 communes.

GIMZO, in *Scripture Geography*, a city of Judah, which the Philistines took from Ahaz. 2 Chron. xxviii. 18.

GIN, in *Geography*, a town of China, of the third rank, in Pe-tcheli; 10 miles S.E. of Chun-te.

GIN, formed probably by corruption from *engine*, in *Artillery* and *Mechanics*, is a machine for raising great weights, composed of three long legs, two of which are kept at a proper distance by means of two iron or wooden bars fixed to one of the legs by means of a bolt at one end, and by the other end to the other leg with a bolt and key, so that it may be put on or off at pleasure. At three feet from the bottom is a roller moving in cheeks, that are fastened to these poles by two iron bands and two iron bolts. The three legs of this machine are joined together with an iron bolt, about which they move; to this bolt is fixed an iron half ring to hook on the windlafs, containing two brass pulleys. When the gin stands upright, and its legs are at a proper distance, one end of the cable is fixed to the dolphins of a gun or mortar with another windlaf, containing likewise two brass pulleys, and the other passes through the pulleys and round the roller, which is turned round by means of handspikes passing through the holes in the ends of the roller; while a man holds the cable tight, the gin is raised to such a height as to admit a carriage being put under it.

The gin is used in loading a timber-carriage with timber; it consists of an acute triangular frame, in the lower part of which is a roll or windlaf; at the apex is a set of pulleys, and a hole to receive the top of a strong pole, which is set up opposite the triangular frame, which by this means forms a sort of tripod (or triangle, as it is commonly called among workmen) standing across a tree to be raised and loaded: the gin-rope is then reeved through a moveable block of pulleys, fastened by a chain to the tree, through that in the top of the gin and round the roll; and then, by means of hand-spikes or levers used to the roll, the tree is drawn up to a sufficient height for the timber-carriage to be passed under it. Long trees are raised at one end first, and two of the wheels of the timber carriage are passed under them; when the other ends are raised in like manner, and the other two wheels (which are made to separate for this purpose) are passed under them, and then are joined to the other wheels by the long adjustable pole with which the carriage is furnished. See *TIMBER-CARRIAGE*.

An erect axis or drum, turned by the force of horses walking in a circle, and used for raising coals and other weights, is also called a gin; the buckets being attached to the opposite ends of a rope, which passes round the drum, and which is drawn by means of its adhesion to the drum. One of the buckets descends empty, while the other is drawn up full; and when the motions of the buckets are to be changed, the horses are turned, or the wheels are made to impel the axis in a contrary direction, when any other moving power is employed.

For shallow mines or shafts, these are worked by horses, and are called horse-gins; and in deep mines thus worked, it is usual to have two levers projecting from the shaft, so as to employ two horses, and even four in some cases, with a boy to each pair, or single horse, to stop and turn them, so as to draw from the other side of the lever, as often as a corve or basket arrives at the top of the shaft. See the article *COAL*.

The increasing depth of the pits, and demand for coals at Newcastle, occasioned Mr. Smeaton, the engineer, to be applied to in the year 1777, by the proprietors of Long Benton colliery, to contrive them a mode of drawing more expeditiously, and larger baskets of

coals than the horse-gins then in use, and he accordingly erected for them a water-gin, the supply for which was raised by the steam-engines employed at the pits. Since the above period, small steam-engines, called winseys in many places, have been applied to the winding of coals, and other minerals, and have already superseded all other modes of drawing at the large collieries; these several modes of drawing or winding we shall describe particularly in the article *WINDING-ENGINE*.

GIN, in *Mining*, horse-gin, or coal-gin, is a machine used for drawing buckets or corves of earth or minerals up a mine-shaft or tunnel-pipe of a canal: it consists of a large vertical drum or barrel, on which a rope winds, which is conducted to pulleys over the shaft; and usually as one bucket or corve descends another ascends. See the preceding article and *MINE WINDING ENGINE*.

GIN-driver, is the man or boy who attends the gin-horse and turns him, when a full bucket or corve has arrived at the top of the mine-shaft.

GINAURI, in *Geography*, a town of Africa, in Kumbo.

GINANNIA, in *Botany*, so called by Scopoli and Schreber in memory of Count Joseph Ginanni, a native of Ravenna, whose posthumous works in Italian, composing two folio volumes, with above 90 plates, were published at Venice in 1755. They chiefly relate to the marine productions of the Adriatic, as corals, fuci, a few shells, &c. but are perhaps not too severely characterized by Linnæus, in a letter to Gerard, as "of no manner of use." The author was recommended to the study of natural history by his friend Valisneri, as a cure for hypochondriacal disorders, but this is hardly a sufficient reason for the publication of his book. Haller appears to have seen the first volume only. Schreb. 271. Mart. Mill. Dict. v. 2. (Paloue; Aubl. Guian. 365. t. 141. Palouea; Juss. 351. *Brownea pauciflora*; Willd. Sp. Pl. v. 3. 716.) See *BROWNEA*, to which genus we are persuaded this plant is rightly referred by Willdenow at the suggestion of Schreber, Addend. 829. The stem is shrubby, 15 feet high, branched, the branches alternate, straight or declining. Leaves simple, alternate, nearly sessile, ovate, entire, pointed, smooth and shining. Stipules minute, acute. Flowers terminal, few, red, large, and handsome. Their short stalks enveloped in large concave imbricated bractæas. Legume reddish, linear, compressed, three inches long, somewhat like that of *Cercis siliquastrum*. Native of the forests of Guiana, flowering in February, and bearing fruit in May.

GINASSERVIS, in *Geography*, a town of France, in the department of the Var, and chief place of a canton, in the district of Brignolles; nine miles N.W. of Barjols. The place contains 782, and the canton 8000 inhabitants, on a territory of 302½ kilometres, in six communes.

GINDARUS, in *Ancient Geography*, a town of Asia, in Syria, situated on a mountain, E. of the gulf of Issicus.

GINDELI, in *Geography*, a town of Candahar, on the Behat; 48 miles E.S.E. of Cabul.

GINDERE, a town of Ceylon; five miles N of Point de Galle.

GINERCA, a town of the island of Corfica, situated in a small bay to which it gives name; 13 miles S. of Calvi.

GINESTAS, a town of France, in the department of the Aude, and chief place of a canton, in the district of Narbonne; seven miles N.W. of Narbonne. The place contains 501, and the canton 6753 inhabitants, on a territory of 167½ kilometres, in 15 communes.

GINETO, Sr. a town of Naples, in Calabria Citra; 16 miles N.W. of Ifigliano.

GINETTA, GENETTA, or *Genet*, in *Zoology*, the *VIVERRA genetta* of Linnæus, which see.

GINGEE,



GINGEE, in *Geography*, a town and fortrefs of Hindoostan, in the Carnatic, once the capital of a kingdom of the same name, situated on a mountain and defended by three castles; 33 geographical miles from Pondicherry and 23 from Trinomaly. N. lat. 12 16. E. long. 79 36.

GINGER, in *Botany*. See AMOMUM.

GINGER, *Zingiber*, in the *Materia Medica*, &c. Ginger is either black or white. In Jamaica this plant attains its full height and flowers about August or September, and fades about the close of the year. When the stalks are entirely withered, the roots are in a proper state for digging, which is generally performed in the months of January and February. After being dug, they are pickled, cleaned, and gradually scalded, or scalded in boiling water: they are then spread out, and exposed every day to the sun till sufficiently dried; and after being divided into parcels of about 100 lb. weight each, they are packed in bags for the market: this is called the "black ginger." "White ginger" is the root of the same plant, but instead of scalding the roots, by which they acquire the dark appearance of the former, each root is pickled, scraped, separately washed, and afterwards dried with great care: by this operation more than double expence is incurred, and the market price is proportionably greater. Black ginger is said by Jacquin to lose part of its essential oil by being thus immersed in boiling water: and on this account it is less useful for medical and other purposes than the white, which is always good when perfectly sound and free from worm-holes: but that imported from the East Indies is stronger than any we have from Jamaica.

This warm aromatic root appears, says Lewis, to be much less liable to heat the constitution than might be expected from the penetrating heat and pungency of its taste, and the fixedness of its active principles. But Dr. Cullen is of opinion, that there is no real foundation for this remark. It gives part of its virtue to water, and the whole to rectified spirit, tinging the latter of a deep, and the former of a pale yellow colour. This latter property it possesses in so considerable a degree, that if a watery infusion of this root be boiled down to a thick consistence, dissolved afresh in a large quantity of water, and strongly boiled down again, the heat and pungency of the root remain, but with little or nothing of its smell. It is used medically as an antispasmodic and carminative. The cases in which it is more immediately serviceable are flatulent colics, debility and laxity of the stomach and intestines, and in torpid and phlegmatic constitutions to excite brisker vascular action. It is seldom given but in combination with other ingredients. In the Pharmacopœias it is directed to be administered under the form of a syrup and tincture; it is also prescribed as a condiment, and as a subsidiary ingredient in many compositions. The syrup of ginger is prepared by macerating two ounces of the ginger root sliced in a pint of boiling water for twenty-four hours, and then straining, and adding two pounds of refined sugar, as in other syrups. The tincture of ginger is formed by macerating two ounces of ginger root sliced in two pints of proof spirit for 14 days, and then straining the liquor. The dietetic qualities and uses of ginger are well known; and it is employed under various forms.

It is not uncommon to candy the root, when green, with sugar and honey; having first steeped it some time in water, to take away part of its acrimony, and to dispose it to let go the outer skin. This candied ginger, brought from abroad, is moderately aromatic. They also make a marmalade of it, and dry cakes.

The northern people make great use of this confection, as holding it sovereign against the scurvy. The Indians eat the root, when green, by way of salad, first chopping it

small, mixing it with other herbs, and seasoning it with oil and vinegar.

Ginger may be preserved by washing it, and laying it to steep for ten or twelve days in white wine and water, stirring them every day; then boil a pound of roots with two quarts of white wine, and about a pint of lemon juice, for a quarter of an hour; then add two pounds and a half of fine sugar, and boil it to a syrup, scumming it as it rises; set it by till the next day in a glazed pan; then boil it for half an hour, and repeat this boiling at the same interval till the ginger is clear. Put it into glasses, and cover them with paper, and it will afford a fine sweetmeat for the winter. A wine is made of ginger, which is a pleasant and salubrious beverage.

GINGER, in *Geography*, one of the smaller Virgin Isles in the West Indies; 10 miles S. W. of Virgin Gorda. N. lat. 18 5'. W. long. 62 53'.—Also, a town of Egypt, on the E. branch of the Nile, opposite to Mansurah.

GINGERBREAD, a richer kind of bread; the flavour and taste of which are heightened and improved with spices, and particularly ginger; whence the name.

There are various forms and preparations of gingerbread; we shall content ourselves with the following receipt, which is well recommended.

Into a pound of almonds, blanched and pounded, grate a penny white loaf; sift and beat them together; to the mixture add an ounce of ginger, scraped fine; and liquorice, and anniseed in powder, of each a quarter of an ounce; pour in two or three spoonfuls of rose-water, and make the whole into a paste, with half a pound of sugar: mould and roll it, print it, and dry it in a stove. Others make it of treacle, citron, lemon, and orange-peel, with candied ginger, coriander, and caraway-seeds, mixed up with as much flour as will make it into a paste.

GINGERO, or LENDERO, in *Geography*, a kingdom of Africa, situated on the S. W. of Abyssinia. N. lat. 6. E. long. about 35.

GINGHAM, a town on the north coast of Sumatra. N. lat. 5° 10'. E. long. 96 10'.

GINGIDIUM, in *Botany*, a name adopted by Forster, Nov. Gen. t. 21, for an umbelliferous plant, found on the hills of New Zealand, which he himself suspected to be a *Ligusticum*, and which has been so considered by following botanists. It is *Ligusticum Gingidium* of Willd. Sp. Pl. v. 1. 1428. See LIGUSTICUM.

The *Physicon* of Dioscorides appears to be likewise of this natural order, but the species can scarcely be determined with certainty. Dr. Sibthorp supposed it might be *Daucus Gingidium* of Linneus, merely from the coincidence of the names, for it agrees better with *D. Fijnyga*, *Armi Fijnyga*, Prod. Fl. Græc. n. 650; not that any thing can be gathered, from the description of Dioscorides, to quote him, in such a case, with any propriety. He says it is "by some called *Lupulum*, and grows very abundantly in Cilicia (now Caramania) and Syria. It is a little herb, like wild carrot, but more slender and more bitter, with a whitish and bitterish root." This will be found to accord equally well with many plants of those countries. Matthioli, misled, as it seems, either by a Latin version, or by the opinion of those who take the *Physicon* of Dioscorides for the *Psyllinaca*, or Parsnip, whereas it is evidently by the description a *Daucus*, or Carrot, took for the *Physicon* a Syrian plant, first described by himself, and which indeed is smaller and slenderer than the Parsnip, though larger and broader than the Carrot. Hence he censures those who have taken the Chervil, *Scandix Cerefolium*, for the herb in question, though they really appear to be more in the right than himself. However this may be, the plant of Matthioli is the *Daucus Gingidium* of Linneus, as well as his *D. Arab.*

Linnaeus having in the first instance defined it from the wood, a cut of Matthioli, and in the latter described it from a specimen in the Upsal garden. The history of this millake is given at length, by the writer of the present article in the Transactions of the Linnaean Society, v. 9. 131.

GINGING, in *Mining*, sinking or staining, signifies the lining of a mine-shaft with stones or bricks for its support. Shallow shafts, where the measures are adapted to stand, are sunk first, and the lining of them with stone, or ginging, is begun from the bottom and carried up at once to the top: but in sinking deep shafts, after as great a depth is done at once as the nature of the measures will permit, a further depth is sunk in the bottom, beginning first within the ginging, and continuing the shaft of that diminished diameter for 12 or 18 inches, according to the soundness of the measures in that place, when it is gradually enlarged to the full size as the sinking proceeds, and sunk some yards lower, until upon reaching a bed of stone, or as great a depth as is judged safe, according to the nature of the sinking, the ginging is begun, and carried up to where the diminishing of the shafts begins; when the same is picked out to admit the successive courses of stone or bricks, as high as is judged safe, then the removal of the remainder of the support for the first ginging is commenced, by cutting out a piece, wide enough to admit of one or two courses of stone or bricks, being built up like a pier, which is firmly keyed or underpinned to the ginging above by means of tile-sheds or thin slate if necessary: a similar piece is then cut out and underpinned on the opposite side of the shaft, and then another between each of these, and so on, until the ginging of the lower and upper part is entirely joined all round the shafts.

The shaft is then deepened within the last ginging, and sunk first narrow and then of its proper width, as far as is judged safe, when a new ginging is begun, and carried up, and joined to that previously finished, as above described. Solid stone-beds or permanent rocks, which are met with in sinking, are not ginged, but the shaft is sunk through such rocks, of the same diameter as the inside of the ginging, which stands upon their top and is pinned up beneath their bottoms.

GINGIVA, in *Anatomy*, the gum; a hard sort of flesh, investing the alveoli, or sockets, of the teeth. See *Gums* and *CANINE*.

GINGLARIUS, in the *Art of Music*, a small Egyptian flute, which, according to Jul. Pollux, was proper for a simple melody, perhaps from having but few holes.

GINGLYMOID, in *Anatomy*, from *gingivus*, a *gingiv*, and *lym*, form; a term applied to certain points of the body. See *FLY-THROAT*.

GINCLYMUS. See *DIARTHROUS*.

GINCO, GINGOUX, or *Gingy*, in *Geography*, a town of the Atlas; 10 miles W. of Agde.

GINERA, in *Dancing*, a kind of dance used at festivals.

GINGRAS, or GINGRAS, in the *Art of Music*, a dance; or name of the band or instrument.

GINGRINA, in *Dancing*, a name for a town, a small kind of dance, or for beginning.

GINGROS, and GINGRUS, *Myrtus Indica*, one of the *Zanthi*. The Pauciflorus according to Linnaeus had the fruit only a palm in length, which produced a nut, but plants for sale. The Chinese make use of them in their kneads, prepared by Celsius, the Physician at present here, as in China and Barbadoes. Their names derive their name from the circumstance of the Phoenicians, at the death of Adams, whereby they called *Gingros*. Encycl. Suppl.

GINHEIM, in *Geography*, a town of Germany, in the county of Hanau Munzenberg; 11 miles W. of Hanau.

GIN-HOAI, a town of China, of the third rank, in Quang-tong; 22 miles N. of Chao-tcheou.

GIN-HOAI, a town of China, of the third rank, in Se-tcheuen; 32 miles S. of Tche-li-leou.

GINPALLAGARUM, a town of Hindoostan; 25 miles E. of Calicut.

GINKGO, in *Botany*, Linn. Mant. 313. Kämpf. Amoen. 811. t. 813.—The Japanese name of a tree, as large as a Walnut-tree, with leaves resembling an *Adiantum*. The male flowers are in catkins, the female solitary, on stalks, producing a drupa, whose nut resembles that of a *Pistacia*, with a white, somewhat astringent, kernel, which is eaten in Japan, being supposed to assist digestion. This tree is hardy in our gardens, sometimes bearing catkins, but no fruit. The late Mr. Gordon sent a living plant to Linnaeus, who mentions it in an appendix by the above appellation, not being able either to define the genus, or to name it properly, till he knew the fructification. Mr. Salisbury having with great assiduity determined its essential characters, it was dedicated to him, by Dr. Smith in the Trans. of the Linn. Soc. v. 3. 330, and his botanical merits will ever justify the appropriation. See *SALISBURY*.

GIN-KIA-CENTZE, in *Geography*, a town of Chinese Tartary. N. lat. 41° 45'. E. long. 123° 29'.

GIN-KIEOU, a town of China, of the third rank, in Pe-tcheli; 17 miles N. of Ho-kien.

GINLIA, a town of Naples, in Abruzzo Ultra; 12 miles N. E. of Teramo.

GINNANI, FRANCIS, in *Biography*, was born at Ravenna in 1716. He was educated in his father's house, and at the age of fourteen was placed at Parma, as page to the duke of Antony Farnese. The duties of this situation did not prevent him from pursuing his studies, and he was particularly attentive to natural history, under the direction of his uncle Joseph Ginnani, who was well known for his researches into marine productions. He devoted himself to a retired and studious life, and was the inventor of divers agricultural instruments and other machines, useful as well as curious. His writings, which relate to almost all the departments of natural history, obtained for him an admission into the learned societies of London, Paris, Bern, and Perugia, and he held a literary correspondence with many of the most eminent natural philosophers of the age. In private life he was courteous, modest, and benevolent, and he was particularly observant of the duties of religion. He died at the age of forty. His principal work was a treatise on the diseases of corn, with observations on the causes and remedies. He published an account of the natural productions in the museum of Ravenna, and he greatly interested himself in the institution of the society of that town. He has been heard in some manuscripts, among which was a "Natural and Civil History of the Pine Forests of Ravenna." Gen. Mag.

GINNIS, in *Geography*, a town of Turkish Armenia; 20 miles W. N. W. of Erzerum.

GINNISH, a town of Hindoostan, in Guzerat; 36 miles E. of Ahmedabad.

GINNONYAN, a town on the E. coast of the island of Leda. N. lat. 10° 27'. E. long. 125° 10'.

GINORIA, in *Botany*, was named by Jacquin, to commemorate a patron of science, and of himself, the marquis Charles Ginori, governor of Lagnora, who was extremely liberal in supporting a botanic garden at Florence. Linn. G. n. 240. Schreb. 323. Jacq. Amer. 148. Willd. Sp. Pl. v. 2. 871. Mart. Mill. Dict. v. 2. Lamarck Dict.

v. 2. 712. Juss. 331. Class and order, *Dodecandria Monogynia* Nat. Ord. *Calycanthema*, Linn *Salicaria*, Juss.

Gen. Ch. *Cal.* Perianth inferior, of one leaf: tube bell-shaped; limb six-cleft: segments lanceolate, spreading, coloured, permanent. *Cor.* Petals six, roundish, spreading, longer than the calyx, with long claws inserted into the neck of the calyx. *Stam.* Filaments 12, awl-shaped, the length of the calyx and inserted into it; anthers kidney-shaped. *Pist.* Germen roundish, depressed; style awl-shaped, as long as the corolla, not deciduous; stigma obtuse. *Peric.* Capsule roundish, depressed, shining, coloured, with about four furrows and four valves, of one cell, gaping at the top. *Seeds.* numerous, minute; receptacle roundish, large.

Ess. Ch. Calyx six-cleft. Petals six. Capsule of one cell, with four valves, coloured, with many seeds.

1. *G. americana*. Linn Sp. Pl. 642. Jacq. Amer. t. 91. — Native of the rocky and gravelly banks of rivers in the island of Cuba. This beautiful shrub has much of the aspect of a myrtle, and bears its flowers and ripe fruit in December. It rises erect to the height of three or four feet, and its branches are round, smooth, and woody. Leaves lanceolate, entire, smooth, spreading, on short foot-stalks, opposite, an inch and half long, numerous. Stalks single-flowered, slender, axillary and terminal. Flowers inodorous, with a reddish calyx, blue corolla, and dark-red capsule, containing a most beautiful berry. Seeds whitish. The capsule remains entire for some time after the seed is shed, together with the calyx and part of the style. The natives call this plant *Rosa del rio*, or river Rose — It has never been introduced into the gardens of Europe, nor have we even seen a dried specimen.

GIN-PIN, in *Geography*, a town of China, of the third rank, in Chan-tong; 17 miles N. E. of Tong-chang.

GIN-SENG, or NIN-SENG, in *Botany*. See PINAX.

GIN-SENG, in the *Materia Medica*, is one of the principal medicines of the Chinese and Tartars; and their most eminent physicians have written many volumes concerning its virtues.

It is known among them by divers other names, expressing only spirit, or the pure spirit of the earth; the plant that gives immortality, &c. It makes, in effect, the whole materia medica for the people of condition, but is too precious for the populace.

All the writers of the Chinese affairs make mention of the gin-feng: as Martinius, in his Atlas; F. Kircher in his China Illustrata; F. Tachard, in his Voyages; and F. Le Comte, in his Memoirs.

And yet we knew but very little of this plant before F. Jartoux, a Jesuit, and missionary in China; who, being employed, by order of the emperor, in making a map of Tartary, in the year 1709, had an opportunity of seeing it growing in a village about four leagues from the kingdom of Corea, inhabited by Tartars, called *Calca-Tatze*.

That father took this opportunity to make a draught of the plant, and give an accurate description of it, with its virtues and manner of preparing it. The gin-feng, according to his description and drawing, has a white root, somewhat knotty: about thrice the thickness of the stem, and which grows tapering to the end; at a few inches from the head it frequently parts into two branches, which gives it some resemblance of a man, whose thighs the branches represent; and it is hence it takes the denomination gin-feng, which signifies a figure of a man.

It is hard to say, why the Chinese should call it gin-feng, a word which signified figure or representation of a man: neither that father, nor any he enquired of, could ever find, that it bore more resemblance to the figure of a man than is ordi-

narily seen among other roots. The Tartars, with more reason, call it *orbota*, that is, the first of plants. It grows to the height of about eighteen inches.

The plant dies away every year: the number of its years may be known by the number of stalks it has shot forth, of which there always remains some mark.

Those who gather the gin-feng preserve only the root, and all they can get of it in ten or fifteen days time they bury together, in some place under ground; then they take care to wash it well, and scour it with a brush; then dip it in scalding water, and prepare it in the fumes of a sort of yellow millet, which gives it part of its colour. The millet is put in a vessel, with a little water, and boiled over a gentle fire; the roots are laid over the vessel, upon small transverse pieces of wood, being first covered with a linen cloth, or some other vessel placed over them.

They may also be dried in the sun, or by the fire; but then, though they retain their virtue well enough, they have not that yellow colour which the Chinese so much admire. When the roots are dried, they must be kept close in some very dry place; otherwise they are in danger of corrupting, or of being eaten by worms.

As to the place where this root grows, it is between the thirty-ninth and forty-seventh degree of north latitude, and between the tenth and twentieth degree of east longitude, reckoning from the meridian of Pekin. Here is found a long tract of mountains, which thick forests, that cover and encompass them, render almost impassable: it is upon the declivities of these mountains, and in these thick forests, upon the banks of torrents, or about the roots of trees, and amidst a thousand other different sorts of plants, that the gin-feng is found: it is not to be met with in plains, valleys, marshes, the bottoms of rivulets, or in places too much exposed and open.

If the forest takes fire and be consumed, this plant does not appear till two or three years after; it also lies hid from the sun as much as possible, which shews that heat is an enemy to it.

The places where the gin-feng grows are, on every side, separated from the province of Quang-tong by a barrier of wooden stakes, which encompass this whole province, and about which guards continually patrol, to hinder the Chinese from going out and looking after this root.

Yet, however vigilant they are, greediness after gain incites the Chinese to lurk about privately in these deserts, sometimes to the number of two or three thousand, at the hazard of losing their liberty, and all the fruits of their labour, if they are taken either as they go out of or come into the province.

The emperor, in order that the Tartars should reap all the advantage that is to be made of this plant, rather than the Chinese, gave orders, in 1709, to ten thousand Tartars, to go and gather all they could find of the gin-feng, upon condition that each person should give him two ounces of the best, and that the rest should be paid for, weight for weight, in pure silver.

It was computed, that, by this means, the emperor would get this year above twenty thousand Chinese pounds of it, which would not cost him above one-fourth part of its value.

We met, by chance, says F. Jartoux, with some of these Tartars, in the midst of those frightful deserts; and their mandarins, who were not far out of the way, came one after another, and offered us oxen for our subsistence, according to the commands they had received from the emperor.

This army of herbalists observed the following order: after they had divided a certain tract of land among their several companies, each company, to the number of a hundred persons, spread itself out in a right line, to a certain fixed place, every ten of them keeping at a distance from the rest.

Then they searched carefully for the plant, going on leisurely in the same order; and in this manner, in a certain number of days, they run over the whole space of ground appointed them.

When the time was expired, the mandarins, who were encamped in their tents in such places as were proper for the subsistence of their horses, sent to view each troop, to give them fresh orders, and to inform themselves if their number was complete.

If any one of them was wanting, as it often happened, either by wandering out of the way, or being attacked by wild beasts, they always looked for him a day or two, and then returned again to their labour as before.

Gin-feng was formerly supposed to grow only in Chinese Tartary, affecting mountainous situations, shaded by close woods, but it has now been long known that this plant is also a native of North America, whence M. Sarasin transmitted specimens of it to Paris in the year 1704; and the gin-feng since discovered in Canada, Pennsylvania, and Virginia, by Laiteau, Kalm, Bartram, and others, has been found to correspond exactly with the Tartarian species, and its roots are now regularly purchased by the Chinese, who consider them to be the same with those of eastern growth, which are known to undergo a certain preparation above-mentioned, by which they assume a somewhat different appearance. This plant was first introduced into England in 1740 by that industrious naturalist, Peter Collinson. The dried root of gin-feng, as it is imported here, is scarcely as thick as the little finger, about three or four inches long, frequently forked, transversely wrinkled, of a horny texture, and both internally and externally of a yellowish white colour. To the taste, says Lewis (Mat. Med.), it discovers a mucilaginous sweetness, approaching to that of liquorice, accompanied with some degree of bitterness, and a slight aromatic warmth, with little or no smell. It is far sweeter, and of a more grateful smell, than the roots of fennel, to which it has by some been supposed similar; and differs likewise remarkably from those roots, in the nature and pharmaceutic properties of its active principles: the sweet matter of the gin-feng being procured entire in the watery as well as the spirituous extract, whereas that of fennel-roots is destroyed or dissipated in the inspissation of the watery tincture. The slight aromatic impregnation of the gin-feng is likewise in good measure retained in the watery extract, and perfectly in the spirituous.

The gin-feng, we have observed, is an ingredient in most of the medicines which the Chinese physicians prescribe to the better sort of patients; they affirm, that it is a sovereign remedy for all weaknesses occasioned by excessive fatigues, either of body or mind; that it attenuates and carries off pituitous humours; cures weakness of the lungs and the pleurisy; stops vomitings; strengthens the stomach, and helps the appetite; disperses fumes or vapours; fortifies the breast; is a remedy for short and weak breathing; strengthens the vital spirits, and is good against dizziness of the head and dimness of sight; and that it prolongs life to extreme old age. Nobody can imagine, that the Chinese and Tartars would set so high a value upon this root, if it did not constantly produce a good effect: those that are in health often make use of it to render themselves more vigo-

rous and strong. And I am persuaded, adds father Jartoux above-mentioned, it would prove an excellent medicine in the hands of any European who understands pharmacy, if he had but a sufficient quantity of it to make such trials as are necessary to examine the nature of it chemically, and to apply it in a proper quantity, according to the nature of the disease for which it may be beneficial.

It is certain, that it subtilizes, increases the motion of, and warms the blood, that it helps digestion, and invigorates in a very sensible manner.

After I had dug the root, he goes on, I observed the state of my pulse, and then took half of a root, raw as it was, and unprepared; in an hour after I found my pulse much fuller and quicker; I had an appetite, and perceived myself much more vigorous, and could bear labour better and easier than before. Four days after, finding myself so fatigued and weary, that I could scarcely sit on horseback, a mandarin, who was in company with us, perceiving it, gave me one of these roots; I took half of it immediately, and an hour after I was not in the least sensible of any weariness. I have often made use of it since, and always with the same success. I have observed also, that the green leaves, and especially the fibrous part of them, chewed, would produce nearly the same effect. The Tartars often bring people the leaves of gin-feng instead of tea: and I always find myself so well afterwards, that I should readily prefer them before the best tea; their decoction is of a grateful colour, and, when one has taken it twice or thrice, its taste and smell become very agreeable.

As for the root, it is necessary to boil it a little more than tea, to allow time for extracting its virtue, as is practised by the Chinese, when they give it to sick persons; on which occasion they seldom use more than the fifth part of an ounce of the dried root.

To prepare the root for exhibition they cut it into thin slices, and put it into an earthen pot well glazed, with about half a pint of water: the pot is to be well covered, and set to boil over a gentle fire; and, when the water is consumed to the quantity of a cupful, a little sugar is to be mixed with it, and to be drank; immediately after this, as much more water is to be put to the remainder, and to be boiled as before, to extract all the juice, and what remains of the spirituous part of the root.

These two doses are to be taken, the one in the morning, and the other in the evening. Phil. Trans. N<sup>o</sup> 337, or Abridg. vol. iv. part ii. p. 314. &c.

Gin-feng has been considered by the Chinese as a powerful aphrodisiac; but a fact to the contrary is alleged by Dr. Cullen in his Mat. Med. v. ii. p. 261. Highly as the virtues of this root have been extolled by the Chinese, and by others, upon their authority, we know of no proofs, says Dr. Woodville (Med. Bot.), of its efficacy in Europe, and from its sensible qualities, we judge it to possess very little power as a medicine. It is recommended in decoction, viz. a dram of the root to be long boiled in a sufficient quantity of water for one dose; but it has been omitted in the last edition of the London Pharmacopœia.

GIO, in *Geography*, a cape of Scotland, on the N. coast of the island Shapinika.

GIO, *St.*, a town of Italy, in Friuli; 11 miles W. of Palma la Nuova.

Gio di Fiore, *St.*, a town of Naples, in Calabria Citra; 16 miles W.S.W. of Umbriatico.

Gio in *Pelago, St.*, an island in the gulf of Venice, near the coast of Istria. N. lat. 45° 15'. E. long. 13° 49'.

GIOAR, in the *Materia Medica* of the ancient Arabians,  
a word

a word applied to several different substances, and sometimes used as the distinct names of them; sometimes only as an epithet to them. It is generally used by Avicenna as a name for arsenic, sometimes for antimony; and in Serapion, we often find it standing for any of the mineral poisons. The original meaning of the word is no more than what the Greeks expressed by the word *ὄστρον*, *substance*; but it became applied to several things most eminent in their way; as to arsenic, the most fatal of poisons; to antimony, supposed at that time the most valuable of medicines; and to pearls, as the most valuable of gems.

**GIOBAR**, in *Geography*, a town of Asiatic Turkey, in the province of Diarbekir; 20 miles N.W. of Trecit.

**GIOCONDO**, **FRAN. GIOVANNI**, in *Biography*, who flourished in the sixteenth century, was a native of Verona, where he taught the learned languages for a subsistence. Among his pupils was the celebrated Julius Cæsar Scaliger. He afterwards became a monk, and was claimed as a brother both by the Dominicans and Franciscans. He was extremely learned in mathematics, and contributed much to the revival of classical learning, by the collection of ancient monuments and manuscripts. He presented to Lorenzo de Medici a collection of ancient inscriptions which he had compiled in Rome. Giocondo was some time at the court of the emperor Maximilian. He visited France, and was employed to build two bridges over the Seine. After this he obtained the title of Architect-royal in France. The time of his death has not been ascertained: it is supposed he did not survive, very long, the year 1521, as he calls himself an old man, eight years before this, in the dedication of a work to Juliano de Medici. He materially served the cause of literature by several works, which did him much credit as a writer, as they likewise extended his fame as an artist. He published an edition of Pliny's epistles, and gave a correct edition of Vitruvius, illustrated with figures, which he dedicated to pope Julius II. He took a part in editing many other works of the ancients, and was the first person who gave a design of Cæsar's bridge over the Rhine. In 1506 he wrote four dissertations, addressed to the magistracy of Venice, concerning the waters of that city. He was employed with Raphael and San Gallo in superintending the erection of St. Peter's. His last work was, probably, the rebuilding of the stone bridge of Verona. *Gen. Biog.*

**GIOFAR**, **AL**, in *Geography*, a town of Arabia; 8 miles S. S. E. of Rabogh.

**GIOGI**, a town of Transylvania, situated near the Maros; 14 miles S. W. of Millenbach.

**GIOJA**, or **GIOVA**, **FLAVIO**, in *Biography*, was born at Paſitane, near Amalfi, in the kingdom of Naples, about the year 1300. Little is known of the history of his life, except that he is thought to have been the discoverer of the directive power of the magnet, by which it disposes its poles along the meridian of every place, or nearly so, and to have applied this important fact to the purposes of navigation, under the form of a compass. As a proof that this instrument was the invention of a subject of the king of Naples, who was a junior branch of the royal family of France, it is said he marked the north point with a fleur-de-lis, by which it is distinguished by the people of every country. As a memorial of this discovery, the territory of Principato, in which Gioja was born, bears, for its arms, a compass. It must not, however, be concealed, that the French and the English have claimed for themselves the honour: and many authors of reputation have given it to the Chinese, who are reported to have known its use long before their intercourse with Europeans, and that the secret

was brought to Italy by Marco Polo Moreri. See the article COMPASS.

**GIOIA**, in *Geography*, a town of Naples, in the province of Bari; 14 miles S. S. W. of Conversano.—Also, a town of Naples, in Abruzzo Ultra; 7 miles S. E. of Celano.—Also, a town of Naples, in Calabria Ultra; 7 miles S. of Nicotera.

**GIOMELU**, a body of the Spanish, or Lorse, in the service of the grand signior.

**GIONI PRATO**, **ST.** in *Geography*, a town of Naples, in Capitanata; 8 miles S. S. W. of Lofina.

**GIORASII**, a town of Arabia, in Yemen; 60 miles N. W. of Saade.

**GIORDANI**, **VITAL**, in *Biography*, was born at Pitonto, a town belonging to the kingdom of Naples, in 1612. He was intended for the church, but deserted the studies necessary for that profession, and married when he had no means of providing for the support of a family. After this he led an idle life, quarrelled with his relations, murdered his brother, and sought for safety by leaving his country. He entered as a common soldier on board the galleys, which pope Innocent X. sent against the Turks in the Levant. He was present in several actions, and gave abundant proofs of his courage and heroism. His talents led him to promotion and he was made purser, a situation which obliged him to improve himself in arithmetic, of which he scarcely knew the elements. What his duty required him to learn, his inclination led him to pursue with pleasure and delight; he became an able mathematician, and was at length chosen professor of mathematics to Christina, queen of Sweden. Lewis XIV. appointed him professor of the same branch of science in the Academy of Sculpture and Painting. This was in 1666, and in 1672 pope Clement X. made him his engineer, and professor at the College of Wisdom. By his great prudence, regularity, and temperance, he redeemed his character, and died in his 78th year. His principal works are "Euclide Restituito," 1686, folio. "Fundamentum Doctrinæ Motus Graviorum," and "Ad Hyacinthum Chirilophorum Epistola." Moreri.

**GIORDANO**, **LUCA**, an historical painter, born at Naples in 1629. His father was an artist of no great repute, who, fancying his son Luca had an inclination to painting, employed him very early in the practice of the art; by which means he acquired an uncommon facility of handling the pencil, and succeeded in imitating the works of great masters. By this, when very young, he gained for his parents considerable wealth; and so eager was his father to make advantage of his ingenuity, that he scarcely allowed the youth time to eat his meals, but was continually urging him to pursue his labours by repeating so incessantly Luca fa presto, (*Luca make haste*) that fa presto became his nick-name among his companions.

His first master of any note was Joseph de Ribera, called Spignoletto; to whose style he, for a time, so much adhered, as to puzzle the most discerning critics. From Naples he removed to Rome, where he industriously studied the noble remains of antiquity, and the works of eminent masters in the art. He fixed himself unhappily with Pietro Cortona, by which it is probable his brilliant imagination was taught to expand itself in a more imperfect and faulty manner than it was originally capable of entertaining. His ready hand, and the freedom, boldness, and precision of his touch, was exactly what Cortona required, and with him he wrought on many noble works in fresco; and was so incredibly expeditious in that way, that he could dispatch as much work in a day, as any other painter could in a week.

His imagination was exceedingly fertile; and this, with the readiness of his hand, and the consequent abundance of

his productions, soon spread his fame over Europe. The King of Spain (Charles II.) desiring to see him paint, and to have the Escorial adorned by his hand, invited him there, ordering him to be paid 1500 ducats de Plata for the voyage, and allowing him to freight the ship that brought him over duty free. He also made him groom of the bed-chamber, honouring him with a golden key, but dispensing with his attendance, that he might be more his own master.

Velasco says, "that it is impossible to express the number and beauty of his compositions in Madrid, Toledo, and at the Escorial; and that he employed only two years to paint ten richly adorned of the church and staircase of that palace. He was exceedingly industrious, generally painting six or seven hours every day; and being highly favoured by the king, became exceedingly rich. It was in 1692 he first arrived at Madrid, and did not return to Italy till 1702, when he accompanied Philip V. to Naples, and in 1704 died there.

Previously to his going into Spain he had executed numerous works in Rome, Genoa, Milan, and other places; and had produced a vast number of pictures in imitation of Titian, Tintoret, Giorgione, &c. &c. which are extremely correct, and exhibit the amazing power of his memory, and the versatility of his genius. The extraordinary facility of painting which he possessed, enabled him to work with great success in fresco, as well as in oil. This very facility is, however, the cause that Giordano's works will never be regarded as standards in the art of painting. Too great a degree of freedom is an enemy to grandeur of style, and the person who possesses it is apt to be too easily satisfied with his productions; and indulging himself in the pleasure afforded by the freshness and clearness of colour and effect produced by it, is unwilling to disturb it in order to render the parts more positively correct; and thus, though ever agreeable, yet works wrought in this manner are too often flimsy and weak in their effect on the mind. This is the character of Luca Giordano, who, though a great master in the art, ranks only in a second or third rate. One of his most considerable productions is the altar-piece of the church of the Ascension at Naples, representing the fall of Lucifer. And in the Durazzo Palace at Genoa, is a fine picture of Senzadying in the Bath; of which, also, there is a duplicate in the gallery at Dresden.

GIORGIEV, in *Geography*, a town of Wallachia, on the N. side of the Danube; 40 miles S.W. of Bucharest. In June 1774, the Russians defeated the Turks near this town, killing 5000 of them, and taking 180 pieces of cannon, with artillery and baggage for 30,000 men. N. lat. 43° 38'. E. long. 25 18.

GIORGIO ANTONIOTTO, in *Biography*, an Italian writer on music, who, having been a considerable time in England, had a work entitled "L'Arte Armonica," translated into English, which he published in two vols. folio, by subscription, under the title of "A Treatise on the Composition of Music," in three books, with an Introduction on the History and Progress of Music from its beginning to this time, written in Italian by Giorgio Antoniotto, and translated into English, 1760, printed by Johnson, Cheap-side.

We had at this time no well digested, clear, and ample treatise of composition in our language. Morley's treatise was become scarce, obsolete, and totally defective in every thing that concerns modern music. We had indeed Malcolm's treatise published in 1721, and that of Dr. Pepusch in 1731. The first is dark and awkwardly written; the second, though excellent as far as it goes, has some prejudices of the old school, which were totally abandoned in

1760, and it is too concise in many particulars to enlighten or satisfy the doubts of young students in many essential points, which were now necessary to be explained, and which in the year 1731 had no existence. Geminiani's "Guida Armonica," so long expected, and published about the year 1746, puzzled the cause, and disappointed every reader. Much therefore was expected, even by professors, from a work in two vols. folio, written by a learned Italian, and nearly half the list of subscribers consisted of the names of the principal composers and organists of the time.

We had a miserable translation of Rameau's treatise, written originally in a musical technica, totally different from that to which we were accustomed, which, with the ungrammatical and bad English into which the rest was translated, threw every one who attempted to read it into despair.

The sonatas and concertos of Corelli, published in score by Dr. Pepusch, and the works of Handel and Geminiani, for those who took the trouble to score them, were excellent lessons of counterpoint, if they had been properly studied. But it is astonishing how long even great performers on instruments remain in utter ignorance of composition. Jack James, Magnus, and Kilway, though admirable organists, never attempted composition, and if they had, after a certain time, they would never have been sure of their ground, but even in making a base to a minuet or country dance would have discovered to real judges, that they were not regular bred contrapuntists.

Signor Antoniotto, we believe, was a perfect judge of the mechanical rules of harmony; but his method is not clear and intelligible to a student out of the reach of a master. His introduction, and historical account of the progress of music from the system of the Greeks to the present time, will amuse, though not accurately instruct, curious readers.

He ascribes to Guido the invention of harmony, and to John de Muris the invention of musical characters, as had been long done by others, who, trusting to tradition, had never seen the Micrologus of Guido, nor the Compendium of John de Muris, by which it has been lately proved, that the laws of harmony were unknown to Guido, and that de Muris himself assigns the invention of musical characters to Magister Franco, who flourished 1047, near 300 years before John de Muris was born. (See FRANCO and DE MURIS.) So much for sig. Antoniotto's historical part.

When he comes to practical music, his definitions are so far from clear to readers in the first stages of counterpoint, that they multiply the student's doubts. His plates have *prima facie* so scientific an appearance as to frighten a *practisante* as much as teaching geometry or algebra would do. His examples of notation are methodically stated; but the joining the old and modern characters in the same table will confuse the student's ideas. He begins with three characters no longer in use, and the semibreve, now the first and longest note, ranks only as the fourth.

His general scale and system of intervals will terrify a young student by the manner in which it is represented; his system of harmonic combinations the same. Plates 14 and 15 of transposed scales are clear and useful, as are the scales in the several clefs.

The *règle de l'octave* seems unknown to the author, and his plain counterpoint is written entirely on a series of sevenths to bases rising or falling by fourths and fifths totally without modulation. No instructions are given for the use of discords, but in examples *a due cori* he gives discords indiscriminately to every note, without informing the student when and where to use them, or speaking of *accented* or *unaccented* parts of a bar.



At plates 48 and 49 the answers to short examples of fugue and imitation are clear and ingenious; but no instructions are given for melody throughout the work. And musical composition consisting of the union of melody and harmony, it seems, at least, to have merited a definition. He might have told the student that it consists of a pleasing series of single notes of various lengths, arranged with grace, divided into equal measure by bars, phrased and governed by rhythm.

At pl. 49, ex. vii. there are *suspensions* of fifths in abundance between the second and third lines, unnoticed by the author.

Page 106, vol. i. the author very justly censures vocal fugues and canons, in which the several voices are singing different words and syllables at the same time; but Rousseau had done this before, in his "Lettre sur la Musique Francoise," 1751. His examples of fugue and canon, which he allows to have an admirable effect in instrumental music, are few and artless. No other examples are given of melody than chords broken into very common passages as variations. Nor of harmony or melody do we find more than two or three examples in triple time, and those of a very common and unmeaning sort.

We remember that the public was much disappointed by this work, which was silently put on the shelf, and has scarcely ever been mentioned since its publication.

GIORGIO GANDINI, a painter, surnamed *del Grano*. He was of Parma, and, if we believe Orlandi, not merely one of Correggio's school, but a pupil, whose works the master himself retouched. The principal picture in St. Michele, erroneously ascribed to Lelio Orsi, is claimed for him by P. Zapata; a performance, though in parts capriciously conceived, of an *impasto*, a relief, a sweetness of colour and pencil, to confer honour on the best of that school. The esteem in which he was held by his fellow-citizens may be conceived, from the commission which they unanimously conferred on him after the decease of Correggio; *viz.* to paint the Tribune of the Duomo. Death prevented him from the execution of it, and the commission fell to a third, to Giralomo Mazzuolo, though not yet ripe for an enterprize of such magnitude. Fuseli's Pilkington.

GIORGIO, *St.* in *Geography*, a town of Naples, in Calabria Ultra; 17 miles S.E. of Nicotera.—Alfo, a town of the island of Lefina; 44 miles E. of Lchina.—Alfo, a town of France, in the department of the Po; six miles N.W. of Chivasso.—Alfo, a town of Naples, in the province of Otranto; four miles E. of Tarento.—Alfo, a town of Naples, in the same province; three miles N.N.W. of Nardo.—Alfo, a town of Naples, in the province of Principato Ultra; three miles S.E. of Benevento.—Alfo, a town of Italy; 10 miles N.W. of Verona.—Alfo, a town of Italy, in the department of the Reno; 11 miles N. of Bologna.

GIORGIONE DA CASTEL FRANCESCO, or GIORGIO BARBARELLI, in *Biography*, was a painter of most uncommon talents, who disputes the rank of head of the Venetian school with Titian. He was born at Castell-Franco in 1477, and acquired the name of Giorgione as well from his superior mode of feeling in art, as from the beauty and elegance of his person and manner. He at first became a scholar of Giovanni Bellini, but soon shook off the minuteness and trifling labour of that school, and substituted breadth and firmness of handling and effect. Vasari observes, that Giorgione, having seen some works of Lionardo da Vinci, wherein the grand style of chiaroscuro was effected, was struck by them, and endeavoured in future to imitate that character in his own pictures. If this be true, which is doubted by some,

he, in adopting that style, did not attempt to vary it, to put his own more pleasing and independent character, proceeding from it in his own manner, as he did in his own. The former could not be done, as he was not a scholar of the latter; but the latter could have done so, and might have done so, if he had not been so early pre-occupied.

He painted in fresco with great splendour and beauty, but little of his labour in that way now remains. He was engaged to paint the bridge of the Rialto in Venice, where he almost altogether resided, and, as he praises the beauty of the colours and the execution of the work, as wanting in price. Many of his pictures are in this country, and they are not by too much extolled for their excellence in character of colour, firmness and freedom of handling; with a mel. in parts, and softness in the rounding, that render them delightfully pleasing to contemplate. One large picture of a Holy Family is in possession of the marquis of Stafford, which is highly laboured as to effect. But, perhaps the most remarkable of his in this country, is a small picture in the collection of the earl of Carlisle, a portrait of Gaudenzio Formigoni with a portrait of his armour. We are not so much inclined to praise a picture that has more truth or beauty of colour, and style of character to recommend it. His portraits, in general, have every excellence required in that interesting branch of the art, and he may be justly styled the father of portrait painting, as since handed down to us by Titian, Van Dyke, and Sir Joshua Reynolds; the three great luminaries that have in different periods succeeded him. It is told of him, that having a dispute concerning the superiority of sculpture or painting; and it being agreed, that sculpture had the advantage, because the figures it produces may be seen all around; he took the adverse side, maintaining, that the necessity of moving, in order to see the different sides, deprived it of its superiority; whereas the whole figure might be viewed at one glance, in a minute. To prove his position, he painted a figure, and surrounded it with mirrors, in which all the various parts were exhibited, and obtained great applause for his ingenuity. He died of the plague, at the early age of 34, in the year 1511.

GIORGY, *Sr.* in *Geography*, a town of Slavonia; 16 miles N.N.W. of Verovitz.

GIORNICO, called by the Germans *Iris*, a town of Switzerland, in the Levantine valley, famous for the victory which 600 Swiss gained, in 1478, over the troops of the duke of Milan, amounting to 15,000 men; a victory which insured to the Swiss an honourable and advantageous peace. In the vicinity of this town, there are many vineyards, and the walnut and chestnut trees are of a very large size, some of them being not less than 30 feet in girth; 13 male N. of Bellinzona.

GIOSTAN, a town of Africa, in the country of Mosambique, at the bottom of a bay not far from Sofala.

GIOTTO, in *Biography*, a painter, conspicuous among those who revived the knowledge of the art in the 13th century. His father was a labourer, who lived at Vicenza, near Florence, and whose name was Fondoni; but he gave the name of Giotto to his son, who was born in 1275, and whom, at an early age, he placed with some other herds to assist in tending their flocks. A child engaged in this employment, he was found by Cimabue drawing a sheep in the sand with so much ingenuity, that the painter was induced to call him to his father, that he might teach him the art of painting. In a short time he not only learned to imitate his master, but also to paint from nature; and, throwing off the dry Gothic manner which reigned till then, endeavoured to give the actual imitation of nature. He soon became far superior to his

his master, and arrived at a degree of art which, in grace at least, was not excelled before Masaccio. M. Fuchs, in his last edition of Pilkington's Dictionary, observes, that "it is not easy to account for the rapidity of his progress, unless we ascribe it to the study of the antique, with which he might have become acquainted at Florence, and afterwards at Rome; and as we know that he was likewise a sculptor, and that models of his existed at the time of Lorenzo Ghiberti; this conjecture becomes highly probable, when we consider the character of his heads, the squareness of his forms, the broad and majestic folds of his draperies, with the grave and decorous attitudes of his figures."

Being contemporary with Dante, it is to him we owe the portrait of that illustrious poet, and also those of many other persons of that period famed for their birth and talents. The great work now remaining, though in a ruined state, which testifies most fully the just ground on which he earned the fame he receives, is at Assisi, in the church of St. Francis, where, in 32 pictures, he has represented the various actions of that saint in the course of his life.

They, together with many other pictures in the same place, are in fresco, and have ever been esteemed of supreme excellence for expression and beauty of composition, and for the grace and truth of actions, and proportions of the figures.

His fame reached the ears of pop: Benedict IX. who sent for him to Rome, and employed him in the Vatican, and in St. Peter's. Clement V. took him to Avignon, where, and in other places in France, he painted many pictures in fresco, and thence drew great riches; returning to Florence in 1316. He afterwards painted in most of the principal cities of Italy, but more particularly at Florence, where his works were studied by succeeding artists, and highly applauded even by Michael Angelo Buonarroti. He died in 1336, aged 60, having enjoyed a life of fame and esteem; and honoured by admission to the citizenship of Florence, as a reward for the honour his great talents conferred upon his country.

GIOVAIN, in *Geography*, a town of Persia, in the province of Kerman; 57 miles E. of Sirgiam.—Also, a town of Persia, in the province of Fa-fistan; 10 miles N. of Schiras.—Also, a town of Persia, in the province of Segeltan; 55 miles W. N. W. of Zareng.

GIOVANA, a town of the republic of Lucca; seven miles N. of Lucca. N. lat. 44°. E. long. 10° 40'.

GIOVANI ANSANI, in *Biography*, a celebrated Italian opera singer, with a tenor voice. His first appearance on the stage was at the theatre royal at Copenhagen, where he remained three years. In 1772, we saw and heard him at Hamburgh, and in 1773 he went to Amsterdam, where, as well as at Hamburgh, he only sung at concerts, there being no opera established in those cities at that time. In 1775 and 1776, he sung at Turin with the Agujari. In 1777 at Naples with Rubinelli.

In 1779 he arrived in England, where he found Roncaglia, whose bounded abilities excited an ambition in the tenor singer to take the *part* of the soprano. Anfani had one of the best tenor voices we had ever heard on our opera stage. It was sweet, powerful, even, and of great compass and volubility. Nor could any defect be justly ascribed to it, except perhaps a little want of variety, spirit, and animation, in singing allegros, to distinguish joy from sorrow. For there was a natural melancholy and pathos in his tones on all occasions, which rendered his performance somewhat monotonous. He was of such a discontented and irritable disposition, that "trifles light as air" occasioned perturbation. He and Roncaglia had been at variance in Italy, and here their enmity broke out anew, with double violence.

Sacchini, with whom Anfani contrived to quarrel, took sides in the dispute between him and Roncaglia, and from the tenor singer's pride, impatience, and irreconcilable disposition, he was in a perpetual warfare during the two seasons he remained in this country.

His figure and countenance on the stage were good; he was tall, thin, and had the look of a person of high rank. He told us, we believe with great truth, that he was *sentire in guai*, always in vexation. He was husband to the Maccherini, who came hither as first woman of the serious opera, without a voice. If ever she *had* a voice, she had lost it before her arrival in this country. We never could receive any pleasure from her performance; every note, feeble as it was, the squeezed out with such difficulty, and with a look so cross and miserable, that after her first exhibition we never wished more either to hear or see the Signora Maccherini, who was so proper a match for her husband in sweetness of disposition, that in Italy, when employed in the same theatre, if one happened to be applauded more than the other, they have been known *mutually* to employ persons to hiss the successful rival. The Maccherini is said to have been once a very agreeable singer, and a considerable favourite on the continent during her bloom; but soon after her first appearance she ran away with an English nobleman, from the theatre in Florence, in her stage dress during the middle of the performance.

GIOVANNI DA SAN GIOVANNI, a painter whose real name was Gio. Mannozi. He was one of the best Italian artists in fresco. Possessing a vivid imagination and a ready hand, his works are numerous, and adorn many of the churches and palaces of Rome and Florence. He did not begin to paint till he was 18 years old, his success is therefore the more extraordinary. The genius he was endowed with being of an irregular nature, he frequently took great liberties in his designs; but his fresco-paintings at Florence shew how well, when he pleased, he could restrain the improper exuberancies of his imagination. He died in 1636, aged 46.

GIOVANNI, *St.* in *Geography*, a town of Naples, in Capitanata; six miles N. E. of Ascoli.—Also, a town of the duchy of Carniola; two miles N. W. of Duino.—Also, a town of Italy; 19 miles N. of Bergamo.—Also, a town of Istria; nine miles N. E. of Pola.—Also, a town of Naples, in Abruzzo Ultra; 13 miles S. of Celano.—Also, a town of Naples, in Basilicata; 17 miles S. W. of Matera.—Also, a town of Italy, in the duchy of Piacenza; six miles W. of Piacenza.—Also, a town of Etruria; 18 miles S. E. of Florence.

GIOVANNI, *St.* or *St. John*, an island in the Mediterranean. N. lat. 36° 27'. E. long. 26° 24'.

GIOVANNI *Rotondo*, *St.* a town of Naples, in Capitanata; 10 miles N. W. of Manfredonia.

GIOVAR, a town of Persia, in the province of Farfistan; 55 miles S. S. W. of Schiras.

GIOVELLINO, a town of Corsica; 25 miles E. of Corte.

GIOVENAZZO, a town of Naples, in the province of Bari, situated near the sea, the see of a bishop; containing four churches, four convents, and defended by a castle; eight miles W. of Bari. N. lat. 41° 17'. E. long. 16° 42'.

GIOVI, a town of Etruria, on the Chieno; five miles N. of Arezzo.

GIPPING, a river of England, in Suffolk, which joins the Orwell, and falls with it into the Stour.

GIPSIES. See EGYPTIANS; under which article the reader will find an account of their supposed origin, migrations,

tions, and character, and of the treatment they have undergone in several countries in which they have appeared. We shall here add, that Muratori, in his "Antichita Italiane," suggests, that it was not before the year 1480 that this singular race of people issued from their concealments, pretending that Egypt was their native country, and that they were deprived of their settlements by a king of Hungary. Notwithstanding the geographical absurdity of this assertion, it was readily credited by the ignorant vulgar. It appears probable, according to this writer, that they drew their origin from Walachia, or the neighbouring countries, as they are still found in great numbers in Hungary, Servia, Bulgaria, and Macedonia. Whether they were expelled from their native dens, or left them spontaneously, and we may add, whatever was the country from which they migrated, it is certain that about this period they began to appear in the western provinces, and by their fraudulent arts were able to gain a footing there, though by nature ever addicted to a vagabond life. They were neither cultivators of the soil, nor artificers, but found an inexhaustible supply of their necessities in theft, rapine, and deceit. Although their mode of life was not unknown to the Italians, their infamous practices were tolerated, because they made the simple people believe, that a penance was imposed upon them of wandering about for seven years; and still more, because they pretended to the gift of divination and forstelling future events. An opinion long prevailed, that they were forbidden to remain longer than three days in one place, and that they had a privilege from the pope of providing themselves with necessary food wherever they should be. The time in which these "Zingari," or "Zingari," as they were called, first made their appearance in Italy, may be collected from the "Miscella Bolognese," published in the 18th volume of the "Rerum Italicarum." Hence we learn, "that on July the 18th, 1422, there came to Bologna a duke of Egypt, named duke Andrew, together with men, women, and children of his country, in number about 100. They had a decree from the king of Hungary, who was emperor, authorizing them to rob wherever they should go for the space of seven years, without being amenable to justice. When they arrived at Bologna, they lodged within and without the Porta di Galliera, and slept under porticoes, except the duke, who was lodged at the king's hotel. They remained here 15 days, during which time many persons visited them, on account of the duke's wife, who understood divination, and could tell what was to be a person's fortune, what was his present condition, how many children he was to have, if a woman was good or bad, and the like. In many things she spoke the truth; and when people went to have their fortunes told, few escaped without laying their pockets picked, or, if women, their cloaths stripped of their ornaments. Their women went, by six or eight together, through the city, entering the houses of the citizens, and prating with them, at the same time fishing what they could lay their hands on. They also went into the shops, pretending to buy something, whilst some of the party were employed in pilfering." Italy did not suffice for this crew, which was gradually augmented by accessions from the men and women of the countries through which they passed. Krantz, in his history of Saxony, writes, that they began to be seen in that country in the year 1417, and he gives a lively description of their customs and cheats, under the name of "Zigeni," or "Zigeuni." Aventine also mentions their arrival in Bavaria, and their mal-practices in 1411. They spread in like manner through Flanders and France, in which country they were called "Egyptians" and "Bohemians," and in Spain they were named "Gitanos." They

are also found in the Turkish dominions. Although they have been frequently banished from various districts, and severe edicts have been issued against them, they still contrive to keep up the race, and carry on their trade of petty pillage and deception.

GIR, or GIH, in *Geography*, a river of Africa, which Ptolemy delineates as equal in length to the Niger, the course of each being probably about 1000 British miles; but running from east to west, till it be lost in the same lake, marsh, or desert, as the Nile, which flows to the west, and lost in an inland sea, in which was the Nile. Some have supposed the Gir of Ptolemy to be the river of Bornou, or Ved-al-Gazel, which joining another considerable river, flowing from Kuku, discharges itself into the N. Nile Palm, or Kanga, and it is so delineated in Rennel's map; but others apprehend, fearfully with better reason, that the Gir of Ptolemy is the Bar Falla of Browne, in his history of Africa. This river, the Nilus Nigerorum, as well as the Nile of Egypt, have their source in the mountains of Kumi, which Browne lays down in N. lat. 7°. The banks of the river Kula, according to this ingenious traveller's information, abound with palmeto trees, and the ferry-boats are partly managed by poles, partly by a double cam. The trees are so vigorous, from the quantity of water and deep clay, that canes are believed to lengthen to contain ten persons. Ptolemy seems to have confounded the Niger with the Gir, which last river he clearly describes as running in the S. E. so as to correspond with the Bar Falla, though he be a stranger to its remote source. The river represented by Ptolemy as receiving two tributary rivers, from two lakes; and many other cities on its banks, a metropolis call'd Gira. The termination of the Gir is not a little obscure, but it seems to be delineated, as falling under a chain of hills, or the N. of the Lybia Palm, or central lake of Africa, and afterwards joining the Nile, as its course to the west. The Passage of Ptolemy, between the Gir and the Niger, may be the W. gora of the Arabs; and his Lybia Palm, which forms the termination of the Niger eastward, seems to be meant, as Rennel observes, either for the largest of the lakes, or for the lakes of that country (of which there are several) collectively. From an accurate examination of Edrisi, who wrote in Sicily in the 12th century, and who, from his minute attention to eastern Africa, has been called the Nubian geographer, it will appear, that while the Nile of the Negroes, which he describes runs to the west, has been mistaken for the Niger, he really knew nothing of that river; and his Nile of the Negroes is the Gir of Ptolemy, terminating in an inland lake, in which was the Island of Uhl, one day's sail from the mouth of the Nile; and in which island another Arabian geographer places the capital city of all Soudan. Beyond this inland island, Edrisi appears to have had no knowledge of central Africa; all the regions he mentions being only those which belong to the Gir. The Nile of the Negroes, running to the N. W. and from his account it would appear that Nubiana is the Delta of the Gir.

GIR, in *Botany*, a name given by some plants, especially the Ravel Tree, which is found in the East Indies, says Mr. Bruce, to find out the true nature of this tree, he advanced to its full height, and found it to be a tree of 200 feet. It is ripe in the beginning of July, and is very sweet, and soon after it is ripe. The fruit is very good, and is the only quality of our antient travels, which has been observed in Europe; nor will it be published in our country, but in the

produced a plant any where but in the garden of the late French king.

GIRA, in *Geography*, a town of Persia, in the province of Mazanderan: 13 miles S. of Sari.

GIRA, in *Ancient Geography*, a metropolis of Libya interior, seated on the river Gir. Ptol. See GIR.

GIRAFFE, in *Zoology*. See CAMELOPARDALIS.

GIRAGLIA, in *Geography*, a small island near the N. coast of Corsica; 23 miles N. of Bastia. N. lat. 43° 1'. E. long. 9° 27'.

GIRALDI, Gualtero Gualterio, in *Biography*, one of the most learned men of his time, was born at Ferrara in the year 1480. He pursued his studies at his native place, and having attained to considerable eminence in the languages, he was sent by the countess Rangone as preceptor to her son Hercolus, afterwards a cardinal. He accompanied the countess to Rome during the pontificate of Leo X., and had apartments assigned him at the Vatican. He appears to have been employed in the instruction of other young persons in polite literature, and continued at Rome during the two next pontificates. He enjoyed but a slender portion of health, and at the sack of Rome he lost all his property, and even his books. This was in the year 1527, when, having lost his friend and patron the cardinal Rangone, he was obliged to leave the capital. In his distress, which was very severe, he went to Bologna, and thence to Mirandola, where he met with a very kind friend in Gianfrancesco Pico. This patron was murdered in 1533, and Giralddi with great difficulty escaped to Ferrara with his life. His poverty was now extreme, but he was not without friends, by whose liberality, especially that of the duchess Renata, he was enabled to lay up a store for the future. He died, after a life of much torture, in the year 1552. So varied was his life, and severe his afflictions, that towards the close of life he complained that he had always to combat against three enemies, Nature, Fortune, and Injustice. His great work was entitled "Syntagma de Diis Gentium." This is the first treatise in which mythology is discussed in a truly learned manner, and it is a treatise which exhibits the vast extent of the author's reading, and for which the learned world is under very great obligations. He was author of several other treatises, "On the Muses;" "The life of Hercules;" "Explications of the Pythagorical Symbols," and other ancient enigmas: "A Treatise of Years and Months, with Greek and Latin Calendars, and thirty Dialogues on subjects of Erudition." He gave "A History of the Greek and Latin Poets," and of "The Poets of his own Time." He was a considerable Latin poet, and it is thought a sense of his own misfortunes induced him to write two small pieces against ingratitude, entitled "Progymnasmatum adversus litteras et litteratos." Moreri.

GIRALDUS, SILVESTER, CAMBRENSIS, one of the most learned and eloquent divines of his time, was born near Pembroke, in South Wales, 1145. Among his numerous works that have been preserved, printed and manuscript, we shall here only advert to an extraordinary passage relative to music, in his "Cambrie Descriptio, cap. XIII." which has been lately quoted by musical writers, and on which great stress has been laid by Eximeno (*Dubbio sopra il faggio fond. prat. di contrap. di P. Martini*) and by Mr. Ed. Jones, *Mus. Relics of the Welsh Bards*.

After all the enquiries that we have made concerning the origin and antiquity of counterpoint, or music in parts, the passage to which we allude surprised us extremely. Many ecclesiastical historians tell us that the organ was first admitted into the church at Rome by pope Vitalian, 666,

the same pontiff who two years after sent fingers into Kent, to finish the work which Austin, the first Roman missionary, had begun. In 680, according to Bede, John, the preceptor of St. Peter's in Rome, was sent over by pope Agatho to instruct the monks of Weremouth in the manner of performing the ritual, who opened schools there and in other places of the kingdom of Northumberland for teaching music.

This may, perhaps, reconcile to probability some part of the following account, which Giraldus Cambrensis gives of the peculiar manner of singing that was practised by the Welsh, and the inhabitants of the north of England, about the end of the twelfth century.

"The Britons," says he, "do not sing in unison, like the inhabitants of other countries; but in many different parts. So that when a company of singers among the common people meets to sing, as is usual in this country, as many different parts are heard as there are performers, who all at length unite in consonance, with organic sweetness. In the northern parts of Great Britain, beyond the Humber, on the borders of Yorkshire, the inhabitants use the same kind of symphonious harmony; except that they only sing in two parts, the one murmuring in the base, and the other warbling in the acute or treble. Nor do these two nations practise this kind of singing so much by art as habit, which has rendered it so natural to them, that neither in Wales, where they sing in many parts, nor in the north of England, where they sing in two parts, is a simple melody ever well sung. And, what is still more wonderful, their children, as soon as they attempt using their voices, sing in the same manner. But as not all the English sing in this manner, but those only of the north, I believe they had this art at first, like their language, from the Danes and Norwegians, who used frequently to invade and to occupy, for a long time together, those parts of the island."

This extraordinary passage requires a comment. And first, it may be necessary, before we reason upon the circumstances it contains, to be certain of their authenticity. Giraldus Cambrensis is indeed an author who has been often supposed inaccurate and fabulous; and the glaring improbabilities in the above account, with the manifest ignorance of the subject in question, by no means contribute to augment his credibility. For whoever is acquainted with the laws of counterpoint, or with the first difficulties attending the practice of singing in parts, can have no exalted idea of the harmony of an untaught crowd, *turba canentium*, or suppose it to be much better than the dissonant peans of a good-humoured mob; in which the parts would be as various as the pitch of voices of which their chorus was composed. But how all these united at last in the consonance of organic melody, and the soft sweetness of *B mollis*, will long remain an impenetrable secret:

"As true no meaning puzzles more than wit."

With respect to what he asserts of the people in Northumberland singing in two parts, it is more reconcileable to probability, from the circumstances just mentioned, of the cultivation of music in that part of the world under Roman masters, who may probably have first brought over the art of discent, or double singing, which the newly invented organ had suggested, by the facility it afforded of sounding two or more notes at a time; which art, when practised by voices, was thence called *organum*, *organizare*. But as to what Giraldus says of children naturally singing in this manner as soon as they were out of the cradle, the reader will afford it what degree of weight he pleases; but for

our own part, we must own that it is not yet admitted into our musical creed.

GIRAN, in *Geography*, a town of Algiers, anciently called *Arina*; 45 miles S.E. of Oran.

GIRANA, a town of Abyssinia; 60 miles N.W. of Gondar. N. lat. 13. E. long. 36° 37'.

GIRANDOLE, a large kind of branched candlestick. See BRANCH and JESSE.

GIRAPIATRA, in *Geography*, a town of the island of Candy; 16 miles S.W. of Settia.

GIRAR, a fortress of Hindoostan, in Malwa; 40 miles S.W. of Chanderec. N. lat. 24. E. long. 79 18'.

GIRARD, GABRIEL, in *Biography*, a distinguished member of the French academy, known as the author of a work entitled "Synonymes François," the object of which is to prove that the French words, usually accounted synonymous, have, almost all, certain shades of difference, which, in correct speech, should prevent them from being used indifferently. No grammatical work was ever better received by the public, and it was the opinion of Voltaire that it will subsist as long as the language. This work has been imitated in English, in one entitled "The difference between words esteemed synonymous in the English language, and the proper choice of them determined," in two vols. 12mo. 1766. The abbé Girard also wrote a French grammar, entitled "Principes de la Langue Française," which has much merit in its plan and theory, but is thought very defective in point of style.

GIRARDON, FRANCIS, an eminent sculptor, intended by his father, who was a founder, for the profession of the law. His inclination for the fine arts could not be controlled, and he was educated as an artist. He was brought up at Troyes, but having acquired much reputation and practice there, he went to Paris to improve his taste and judgment under the sculptor Anguier. His performances obtained for him a high degree of reputation; he was noticed by the king, and by him sent with a liberal pension to Rome. In 1657 he was admitted into the academy, and was patronized by Le Brun. Girardon is reckoned to have had more correctness than invention; and he is said to have modelled with more facility than he worked in marble. His principal works are, four figures composing the group of the baths of Apollo, and the rape of Proserpine in the gardens of Versailles; the equestrian statue of Lewis XIV. and the mausoleum of cardinal Richelieu, in the church of the Sorbonne. He cultivated the friendship of the fine writers of the age, several of whom have done honour to his merits and memory. He was nominated to the chancellorship of the academy in 1695. After having adorned the capital and many other parts of the kingdom with a number of works, and risen to the very head of his profession, he died in 1715 at the age of eighty-five. Moreri.

GIRBE, in *Geography*, a town of Egypt, on the right bank of the Nile; 26 miles N. of Syencé.

GIRBEH, a river of Switzerland, which runs into the Aar, two miles S. of Berne.

GIRCH, a river of North Wales, which runs into the sea, near Pwllheli, Caernarvonshire.

GIRCHSBECK, a town of the duchy of Holstein; six miles W S W. of Oldeflohe.

GIRCZENI, a town of Moldavia; 30 miles N.N.E. of Galatz.

GIRDERS, or GIRDING beams, in *Carpentry*, are those large beams thrown across a room, in order to shorten the bearing of the joists.

When the bearing is not very great, the girder consists of a single beam; when it is more than common, the baulk, or

piece of wood out of which the girder is made, is sawn down the middle, and the two pieces are riveted and bolted. In great bearings the girder is framed like the principals of a roof, for the construction of which we refer our reader to the article CARLENTRY, and *Naked Trussing*.

No girder ought to be less than ten inches in the wall, nor ought they, or any principal beam, to be placed over an aperture. They ought to be of the most hearty wood, and as free of knots as possible, for knots destroy the continuity of the fibres, and consequently impair the strength.

GIRDING-GIRT, in *Sea Language*. The seamen say a ship is *girt*, or hath a *girding-girt*, when her cable is so tight or framed, that upon the running of the tide she cannot go over it with her stern part, but will lie across the tides.

GIRDLE, CINGULUS, or *Zona*, a belt or band of leather, or other matter tied about the loins, to keep the part more firm and tight.

It was anciently the custom for bankrupts, and other insolvent debtors, to put off and surrender their girdle in open court. The reason was, that our ancestors used to carry all the necessary utensils, as purse, keys, &c. tied to the girdle; whence the girdle became a symbol of the estate. History relates, that the widow of Philip I. duke of Burgundy, renounced her right of succession by putting off her girdle upon the duke's tomb. Accordingly the girdle amongst the ancients was used for a purse. Our Saviour forbid his apostles to carry money in their girdles, Matt. x. 9. Haggai, i. 6. Horace says, that he who has lost his girdle (his money) is ready for any thing. "Ibit eò quo vis, qui zonam perdidit." Hor. Ep. l. ii. c. 1. The Romans always wore a girdle to tuck up the tunica, when they had occasion to do any thing; this custom was so general, that such as went without girdles, and let their gowns hang loose, were reputed idle, dissolute persons.

GIRDLE, *Mulier's* or *Virgins*'. It was the custom among the Greeks and Romans for the husband to untie his wife's girdle. Homer, lib. xi. of his *Odyssy*, calls the girdle *περὶ τῆς ζώνης, maid's girdle*. Festus relates, that it was made of sheep's wool, and that the husband untied it in bed: he adds, that it was tied in the Herculean knot; and that the husband untied it, as a happy preface of his having as many children as Hercules, who, at his death, left seventy behind him.

The poets attribute to Venus a particular kind of girdle, called *cyllus*, to which they annexed a faculty of inspiring the passion of love.

GIRDLE, *Quicksilver*, in *Medicine*, is a sort of girdle smeared over with mercury, or having mercury inclosed within it.

It is made of leather, linen, cloth, cotton, stuff, or the like; and the mercury is prepared or killed various ways; as with fasting spittle, fat, or the like.

It is applied as a topical medicine about the waist, sometimes with good effect; but frequently it proves dangerous, principally in weak constitutions, and those subject to convulsions. Its intention is, the cure of the itch, driving away vermin, killing lice, &c.

GIRDLE, *Queen's*, is an ancient duty or tax, raised at Paris every three years, at the rate of three deniers upon each muid of wine, and six for each queue: it was intended for the maintenance of the queen's household; afterwards they augmented and extended it to other commodities, as coals, &c.

Vigenere supposes it to have been originally thus called, because the girdle anciently served for a purse; but he adds, that a like tax had been raised in Persia, and under the same name, above two thousand years ago; as appears from Plato, in his *Alcibiades*, Cicero, *Atticus*, &c.

**GIRDLE**, *Christians of the*. Metawekel, tenth caliph of the family of the Abassides, enjoined the Christians and Jews, in the year of the Hegira 235, of Jesus Christ 856, to wear a large leathern girdle, as a badge of their profession; which they wear to this day throughout the East: from which time the Christians of Asia, and particularly those of Syria and Mesopotamia, who are almost all Nestorians or Jacobites, have been called "Christians of the girdle."

**GIRDLE**, *Order of the*, the order of Cordeliers. See **CORD** and **CORDELIERS**.

**GIRDLE**, in *Mineralogy*. See **CINCTURE**.

**GIRDLE**, among *Jewelers*, the line which encompasses the stone parallel to the horizon; or, which determines the greatest horizontal extension of the stone.

**GIRDLE WHEEL**, a small spinning-wheel, made for hanging to a woman's girdle or apron-string, so that she may spin with it though walking about.

**GIRDLE**, in *Mining*, is the name used in Cumberland, and some other counties, to denote the uncertain strata, or chancé beds, of stone and different substances that are met with in some districts; which, instead of occupying the whole space, of the same or nearly an equal thickness throughout, are only local, preserving, however, constantly the same relative situation to the other strata, wherever they appear; that is, they are peculiar to particular places in the series of strata, and seem, according to the numerous enquiries and observations which Mr. Farey, sen. has made on these anomalous masses in the stratification, to be lenticular in their shape, always ending insensibly or with sharp-edges on all sides, like extremely flattened nodules; and, except in shape and size, and their rarity, he conjectures that they differ nothing from the nodules which are so very common in particular strata, as of iron-stone in the binds and shales of most coal-fields, and in the grit-stones of some; those of pyrites in many coal-seams, some of the nodules of flint in the upper chalk strata, &c. &c. Particular strata in the British series are found to be subject to these chance beds, or strata, within their mass; some of which large nodular masses assume a confusedly crystallized structure, and seem to occasion large hills and even mountainous tracts, as Charnwood Forest, in Leicestershire, whose sienite and slate, &c. have been referred, by the gentleman named above, to the anomalous masses of the red-ground or marle strata. See *Philosophical Magazine*, vol. xxxi. page 40.

**GIRDLENESS**, in *Geography*, a cape on the E. coast of Scotland. N. lat. 57° 4'. W. long. 2° 2'.

**GIRELLI AGUIARI**, in *Biography*, a female opera singer, who arrived here the same season as Millier, in 1772. Her style of singing was good, but her voice was in decay, and her intonation frequently false, when she arrived here; however, it was easy to imagine from what remained, that she had been better. She remained here only one season, and was succeeded by Mrs. Cecilia Davies.

**GIREST**, in *Geography*, a town of Persia, in Kerman; 160 miles E.N.E. of Comran.

**GIRÉ**, a town of Persia, in Mazanderau; 30 miles S. of Behabad.

**GIRGASHITES**, in *Scripture Geography*. See **GERGASHITES**.

**GIRGE**, the capital of Upper Egypt, and the residence of the Bey, situated about 400 yards from the left bank of the Nile. This town is about a league in circumference, and has several mosques, bazars, and public squares; but it has no remarkable buildings nor ancient edifices, whence some have inferred that it is a modern building, more especially as Abuleda does not mention it. The Bey lives in great state, and continues in office three or four

years, according to the pleasure of the divan at Cairo. His soldiers commit innumerable outrages. The Copts are not allowed to have churches in that town; and therefore when they would join in divine service, they are obliged to go to a convent situated on the other side of the Nile. The Franciscans, who have a convent here, pass for physicians, but they are frequently exposed to danger from the insolence of the Janizaries: the most refractory of whom are sent hither from Cairo; 160 miles N. of Syené. N. lat. 26° 30'. E. long. 31° 52'.

**GIRGENTI**, or **AGRIGENTI**, a town of Sicily, near the S. coast of the valley of Mazara, erected near the ruins of the ancient *Agrigentum* (which see), and occupying only the ground on which the citadel of the ancient city stood; the see of a bishop, situated on the river St. Blaife, about three miles from the sea; 47 miles S. of Palermo. N. lat. 37° 22'. E. long. 13° 33'. Its situation on a mountain renders almost all the streets impassable, not only for carriages but even for mules. The population of Girgenti falls far short of that of the ancient Agrigentum, which Empedocle reckons at 800,000; whereas at present, reckoning the city, properly so called, which was the ancient castle, the suburb of Camico, and that built by Henry and Constantine in the 12th century, it is reduced to 15,000 persons, generally poor and of a melancholy appearance. The nobility here are poor, and live in great privacy; the merchants, wholly taken up with their own affairs, see nobody but at the exchange; without society and without amusements, every body is, or appears to be, gloomy and devout. The port of Girgenti, very different from the mole of the ancient Agrigentum, which was at the mouth of the Acragas, and of which not a single trace is left, is subject to the same inconvenience with that of the harbours of Apulia and Calabria, which is that of being liable to be filled up equally by two opposite winds, viz. the south-easterly and north-westerly. The two piers erected to remedy this inconvenience having been found insufficient, the government has been obliged, as at Cortona, to employ galley-slaves for emptying and cleaning the entrance of this port; nor can their laborious work be abandoned on account of the importance of this harbour in the exportation of commodities from all the southern part of Sicily; and the shelter it affords to the Neapolitan vessels in the seas most exposed to the Barbary corsairs, being almost within sight of Africa. Near the mole are the admirable magazines of the "Caricatoria," the richest in Sicily, consisting of caverns or cisterns cut out of the rock, in which the corn is preserved without the least injury. These magazines belong to the king, and secure the subsistence of the island. Foreign merchants resort hither to purchase the surplus, after reserving enough for the home consumption. The king is accountable for the corn lodged there, and the proprietors have only a small sum to pay for store-house rent.

**GIRGITES**, a name used by some chemical writers for a sort of white stones found in rivers, of which they make a peculiarly strong lime. The stones are of the sparry kind, worn into roundness by the motion of the water: and they have their name girgites, from the word *gir*, used by the chemists for lime.

**GIRGITZA**, in *Geography*, a town of Walachia; 40 miles N.N.E. of Bucharest. N. lat. 45° 1'. E. long. 26° 19'.

**GIRIA**, a town of the island of Cephalonia; 16 miles W. of Cephalonia.

**GIRKIN**, among *Gardeners*. See **GUERKIN**.

**GIRLE**, or **GYRLE**, among *Sportsmen*, denotes the roebuck in its second year.

**GIRMANO**,



**GIRMANO**, in *Geography*, a town of Prussia, in Samland; 25 miles N.W. of Königsberg.

**GIROMAGNY**, a town of France, in the department of the Upper Rhine, and chief place of a canton, in the district of Besort. The place contains 1700, and the canton 9572 inhabitants, on a territory of 150 kilometres, in 19 communes.

**GIRON DE LOYASA, GARCÍAS**, in *Biography*, a learned Spanish prelate, who flourished towards the close of the 16th century, was born at Talavera. In the course of his studies he had paid a marked attention to philosophy and theology; to history and the councils, with which he became intimately conversant. He lived in a retired way as a canon, till his uncle resigned to him the archdeaconry of Guadaluja, which is one of the dignities belonging to the church of that city. In 1585, Philip II., king of Spain, sent for him to court, made him master of the royal chapel and almoner; and likewise entrusted to his care the education of his son Philip, infant of Spain. In 1596, Cardinal Albert assumed the government of the Low Countries, and appointed Giron his vicar-general over the archbishopric of Toledo; to which valuable see he was himself afterwards preferred. He died in 1599, and his death has been imputed to the chagrin which he felt for the neglect shown him by his pupil, who had lately succeeded to the throne. He was author of a valuable collection of Spanish councils, under the title of "Collectio Conciliarum Hispaniæ, cum Notis et Emendationibus." Moreti.

**GIRON**, in *Geography*, town of Africa, on the Ivory coast.—Also, a town of S. America, in the province of Quito; 25 miles S. of Cuenca.

**GIRON**, or *Guiron*, in *Heraldry*, denotes a triangular figure having a long sharp point, not unlike a wedge, terminating in the centre of the escutcheon.

The word is French, and literally signifies the *geranium* or *lap*; because, in sitting, the knees being supported somewhat asunder, the two thighs, together with a line imagined to pass from one knee to the other, form a figure somewhat similar to this.

When a coat has six, eight, or ten of these girones, meeting or centering in the middle of the coat, it is said to be *gironé* or *gironny*.

**GIRONDE**, in *Geography*, a river of France, formed by the union of the Garonne and Dordogne: 12 miles N. of Bourdeaux, which runs into the Atlantic, after a course of about 27 miles N. N. W.

**GIRONDE**, one of the nine departments of the south-west, or Garonne region of France, deriving its name from the river Gironde. It is a maritime department, composed of a portion of Guienne, in N. lat. 44° 40', and bounded on the N. E. by the department of the Lower Charente, on the E. by the departments of the Dordogne and Lot and Garonne, on the S. by the department of the Landes, and on the W. by the sea. Its capital is Bourdeaux. This department contains 11,270 kilometres, or about 537 square leagues, and 519,685 inhabitants, and is divided into six districts; *viz.* Blaye, comprehending 4 cantons, 61 communes, and 52,026 inhabitants; Libourne, including 9 cantons, 143 communes, and 102,576 inhabitants; La Rochelle, comprehending 6 cantons, 118 communes, and 53,703 inhabitants; Bazas, containing 7 cantons, 68 communes, and 47,549 inhabitants; Bourdeaux, comprehending 18 cantons, 153 communes, and 233,021 inhabitants; and L. Barre, containing 4 cantons, 37 communes, and 30,808 inhabitants. Its contributions amount to 5,853,053 francs, and the expenses for administration, justice, and public instruction to 533,643 francs. The soil of this department is various:

the east and north-east districts are the most fertile. In the valley between Agen and Bourdeaux, the soil, though light, is of an excellent quality. The west and south-west parts are sandy, marshy, and barren, or indifferent to the soil. The products of the soil are grain, hemp, flax, wine, and fruits, pastures, considerable forests of pine, stone-quarries, mineral springs, &c.

**GIRONELLA**, a town of Spain, in Catalonia; 7 miles E. N. E. of Solsona.

**GIRONNE**. See **GIRONA**.

**GIRON**, *St.* a town of France, and principal place of a district, in the department of the Ariege; 21 miles W. of Tarascon. N. lat. 42° 50'. Long. 1° 13'. The place contains 2523, and the canton 14973 inhabitants, on a territory of 287½ kilometres, in 16 communes.

**GIROST**, a town of Persia, in the province of Kerman; 125 miles S. of Sijian.

**GIROCK**, in *Zoology*, the common English name of the fish called the *Lacerta*, a large species of garfish, caught in the Mediterranean and English seas.

**GIRONNE**, *Gironis*, in *Heraldry*, is when a shield or coat is divided into several girones, which are alternately colour and metal.

When there are eight pieces, or *girones*, it is absolutely said to be *gironné*: when there are more, or fewer, the number is to be expressed; *gironné* of four, of fourteen, &c.

Some, instead of *gironné*, say, *part, sape, trench, and tail*, because the girones are formed by such divisions of the field. Four girones form a *falzier*, and eight a *cross*.

**GIRT**, in measuring timber, is used for the circumference of a tree. See *Cogsthal's Sizing rule* and **DIAZ-DROMETER**.

Some call the fourth part of the circumference the *girt*, and suppose the square of this equal to the area of the section of the tree.

**GIRT**, in *Architecture*, the same with **fillet**. See **FILLET**.

**GIRT, Girdle**, in *Sea Language*. See **GUARDING**.

**GIRT-line** is a rope passing through a single block, on the head of the lower masts, to hold up the rigging thereof; this is the first rope employed to rig a ship, and by means of this all the rest are drawn up and fixed; after which it is removed till the ship is to be unrigged.

**GIRTHS of a Saddle**, the long straps, made of a curvas stuff called girth-web, which being buckled under the horse's belly, serve to fix the saddle.

**GIRTIN, THOMAS**, in *Literature*, a draftsman of uncommon capacity, who lately adorned our days, and if he had not been cut off by an early death, would probably have exhibited unrivalled talents in the peculiar branch of the art he adopted. He was born in 1777, and was one of those who have contributed to raise almost a new species of art, the use of water-colours in landscape painting. He drew with a ready hand, in a style entirely his own, and with great taste and effect; though not always with a strict adherence to truth. He died of consumption, brought on by irregularity, at the early age of 27.

**GIRU**, in *Geography*, a town of Persia, in the province of Mazanderan; 5 miles E. of Ferehad.

**GIRVAN**, a sea-port of Scotland, in the county of Ayr, situated at the mouth of the river Girvan, which rises in the N. E. part of the county, and runs into the sea a little below the town. It has a commodious harbour, capable of great improvement. The chief employment of this town, which is a burgh of burgh, governed by bailies and consuls, annually elected, is rearing of cotton and woollen cloths. In 1801 the number of inhabitants was 2260, of whom 1360 were employed in trade and manufactures. The neigh-

neighbourhood abounds with limestone and coal; 21 miles S. S. W. of Ayr. N. lat. 55° 18'. W. long. 4° 44'.

**GISARMS**, or **GUISARMS**, in our *Old Writers*, an halbert or land-axe: it comes from the Latin *bis arma*, because it wounds on both sides. Shene. "Est armorum genus longo manubrio et porrecta cuspidē." It is mentioned in the statute 13 Edw. I. cap. 6.

**GISBOROUGH**, in *Geography*, a market town and parish in the North Riding of the county of York, is seated near the mouth of the river Tees, 8 miles from Stokesley, and 248 from London. By the population returns, printed by order of parliament in 1801, this parish contained 383 houses and 1719 inhabitants. In the time of king James I. some alum mines were discovered here, and were worked for several years with great success. The bay at the mouth of the Tees forms a commodious harbour. In this town was formerly a spacious monastery, of which some considerable ruins remain. Here are a weekly market on Friday, and five annual fairs.

**GISCALA**, in *Scripture Geography*, a town of the tribe of Asher, in Lower Galilee; S. E. of Jotapa.

**GISEKIA**, in *Botany*, named by Linnæus in honour of his pupil Dr. Paul Dietrick Giseke, professor of Natural History at Hamburg, and editor of the *Prælectiones in Ordines Naturales Plantarum*, compiled from his own notes and those of Fabricius, taken from the mouth of Linnæus, and published by his leave. Linn. Mant. 554. Schreb. 207. Willd. Sp. Pl. v. 1. 1547. Mart. Mill. Dict. v. 2. Juff. 315. Lamarck Illustr. t. 221. (Kolreutera; Murr. Comm. Nov. Goett. v. 3. 67. t. 2. f. 1.)—Class and order, *Pentandria Pentagynia*. Nat. Ord. *Succulente*, Linn. *Portulacæ*, Juss.

Gen. Ch. Cal. Perianth of five ovate, concave, obtuse, permanent leaves, with membranous edges. Cor. none. Stam. Filaments five, short, awl-shaped, ovate at the base; anthers roundish. *Pist.* Germen superior, roundish, retuse, deeply five-lobed; styles five, short, recurved; stigmas obtuse. *Peric.* Capsules five, roundish, slightly compressed, rough, obtuse, close together, each of one cell. *Seeds* solitary, ovate, smooth.

Spec. Ch. Calyx of five leaves. Corolla none. Capsules five, approximated, roundish, single-seeded.

1. *G. pharnacisoides*. Linn. Mant. 562. Native of the East-Indies. A smooth annual herb, with the aspect of an *Illecebrum* or *Pharnaceum*. The *stems* are prostrate, a foot or two in length, furrowed along their upper side, alternately branched. *Leaves* opposite, stalked, obovate, entire, light green, rather fleshy. *Flowers* small, green, in little axillary umbels. *Fruit* blackish. On the short axillary branches, the leaves, as Jussieu well observes, are opposite. No other species has been discovered.

**GISELO**, in *Geography*, an island on the E. side of the gulf of Bothnia. N. lat. 61° 40'. E. long. 21° 22'.

**GISGI**, a town of Transylvania, near the Maros; 14 miles S. W. of Millenbach.

**GISHI**, a town of Georgia, in the province of Kaketi; 115 miles S. E. of Teflis.

**GISHUBEL**, a town of Bohemia, in the circle of Koniggratz; 20 miles E. N. E. of Koniggratz.

**GISING**, a town and castle of Hungary; 14 miles S. W. of Steinam-Anger.

**GISIO**, a town of Sweden, in Angermannland, on the Gidea; 16 miles W. of Nordmalling.

**GISLAVY**, a town of Sweden, in the province of Smaland; 40 miles S. W. of Jonkioping.

**GISON**, or **GEISON**, in the *Jewish Antiquities*, a little wall about breast high, made round the temple properly so called, and the altar of burnt sacrifices, to keep the people

at a distance. Josephus, in his Book of Antiquities, makes it to be three cubits high; and but one, in his History of the Jewish war. Jos. Antiq. lib. viii. cap. 2. p. 262. et de Bello Jud. lib. vi. p. 918. Calm. Dict. Bibl.

**GISORS**, in *Geography*, a town of France, in the department of the Eure, and chief place of a canton, in the district of Les Andelys; 27 miles N. E. of Evreux. The place contains 3500, and the canton 6496 inhabitants, on a territory of 147½ kilometres, in 23 communes. N. lat. 49° 17'. E. long. 1° 50'.

**GISSINGHEIM**, a town of Germany, in the county of Wertheim; 15 miles S. of Wertheim.

**GISTAIN**, a town of Spain, in Arragon, situated on a brook in the Pyrenæes, on the confines of France, having in its vicinity mines of cobalt; 15 miles N. of Ainsa.

**GISTO**, a small island in the Adriatic. N. lat. 44° 36'. E. long. 14° 51'.

**GISUND**, a town of Norway, in the diocese of Drontheim; 44 miles N. W. of Drontheim.

**GITHAGO**, in *Botany*, a name used by some authors, particularly by Pliny, for the Iolium or daniel-grass.

**GITI**, in *Geography*, a town of Thibet; 234 miles N. E. of Delhi. N. lat. 32° 10'. E. long. 79° 36'.

**GITPOUR**, a town of Mocaumpour; 47 miles S. W. of Mocaumpour.

**GITSCHIN**, a town of Bohemia, in the circle of Koniggratz; 22 miles N. W. of Koniggratz. N. lat. 50° 23'. E. long. 15° 20'.

**GITTITH**. This word occurs frequently in the Psalms, and is generally translated *zine-proffes*. The conjectures of interpreters are various concerning this word gittith. Some think it signifies a sort of musical instrument; others, that the Psalms, with this title, were sung after the vintage; lastly, others, that the hymns of this kind were invented in the city of Gath. Calmet is rather of opinion, that it was given to the class of young women, or songstresses of Gath, to be sung by them. (Ps. viii. 1. lxxxii. 1. lxxxiv. 1.) Dr. Hammond thinks that the Psalms, with this title, were all set to the same tune, and made on Goliath the Gittite.

**GIVA**, in *Geography, a town of Asiatic Turkey, in Nattolia; 32 miles S. E. of Milets.*

**GIVANIROTONDO**, a town of Naples, in Capitanata; 9 miles W. of Monte St. Angelo.

**GIUDEL**, a small island, near the south coast of Sardinia. N. lat. 39° 1'. E. long. 9° 3'.

**GIUDUCCA**, **LA**, or **ZUCCA**, one of the islands adjoining to the city of Venice, which is said to owe its name to the Jews, who formerly resided there. It contains 10 churches, 4 monasteries, and as many nunneries.

**GIVEN**, **DATUM**, a term very frequently used in *Mathematics*, signifying a thing which is supposed to be known.

Thus, if a magnitude be known, or we can find another equal to it, we say, it is a given magnitude, or that such a thing is given in magnitude.

If the position of any thing be supposed as known, we say, given in position.

Thus, if a circle be actually described on a plane, its centre is given in position, its circumference given in magnitude, and the circle is given both in position and magnitude.

A circle may be given in magnitude only; as when only its diameter is given, and the circle not actually described.

If the kind or species of any figure be given, they say, given in specie. If a ratio between any two quantities is known, they are said to be given in proportion. See **DATA**.

**GIVET**, in *Geography*, a town of France, in the department of the Ardennes, and chief place of a canton, in the district of Rocroy; 15 miles N. E. of Rocroy. N. lat. 50° 7'. E. long.

E. long. 4° 51'. The place contains 3533, and the canton 8445 inhabitants, on a territory of 130 kilometres, in 20 communes.

GIUP, LA, a district of Arabia, in the province of Nedsjed; E. of mount Ramleah.

GIULA, a town of Hungary, situated on the river Keres; 52 miles N. N. W. of Temeswar. N. lat. 46° 35'. E. long. 20° 55'.

GIULAB, a town of Asiatic Turkey, in the government of Diarbekir; 18 miles N. N. E. of Orfa.

GIULENEI, a small island in the Caspian sea; 130 miles S. of Afrachan. N. lat. 44° 15'. E. long. 47° 49'.

GIULIA NUOVA, a town of Naples, in Abruzzo Ultra, on the coast of the Adriatic; 12 miles E. N. E. of Teramo.

GIULIA, St. a town of France, in the department of the Stura; 12 miles S. S. W. of Aequi.

GIULIANO, Sr. a mountain of Etruria, near Pisa, at the foot of which are warm baths, known in the time of Pliay.—Alfo, a town of Naples, in Capitanata; 9 miles W. S. W. of Dragonera.—Alfo, a town of Naples, in the county of Molise; 13 miles S. S. E. of Molise.—Alfo, a town of Naples, in the province of Otranto; 17 miles S. S. W. of Brindisi.—Alfo, a town of Italy, in the department of the Olona; 7 miles S. E. of Milan.

GIVORS, a town of France, in the department of the Rhone, and chief place of a canton, in the district of Lyons; 12 miles S. of Lyons. The place contains 3200, and the canton 10,590 inhabitants, on a territory of 90 kilometres, in 10 communes.

GIVRY, a town of France, in the department of the Saone and Loire, and chief place of a canton, in the district of Chalons-sur-Saone; 4 miles W. of it. N. lat. 46° 47'. E. long. 4° 50'. The place contains 2582, and the canton 11,405 inhabitants, on a territory of 132½ kilometres, in 13 communes.

GIUSEPPE APRILE. See TENDUCCI.

GIUSEPPE ARENA, in *Biography*, an able composer of Naples, whose style had much of the brilliancy of that school. In 1741 he set the serious drama of Tigrane, written by Goldoni, to music, for the great theatre of St. John Chrysoftom, at Venice, which established his character.

GIUSMARK, in *Geography*, a town of Curdistan; 80 miles S. S. E. of Betlis.

GIUSTENDIL, a town of European Turkey, in Bulgaria; 24 miles S. of Sophia.

GIUSTINELLI, in *Biography*, a second-rate Italian singer in soprano, arrived here, in 1762, with De Amicis and her family, as first serious man in the barletta operas. He had a good voice, and sufficient merit to supply the place of second man on our stage, in the serious operas, for several years after.

GIUSTINIANI, AUGUSTIN, was born at Genoa in 1470, was educated for the church, and in 1514 was made bishop of Nebbio in Corsica. He published, in 1516, a Pfalter in four languages, *viz.* the Hebrew, Greek, Arabic, and Chaldee, with interpretations: this was the first of the Polyglott editions of the books of scripture. After this, he was invited by Francis I. to Paris, and appointed to the professorship of the Oriental languages in that university, an office which he held about five years. During this period he received a pension from the crown, and was enabled to collect a very choice library, which he afterwards presented to the republic of Genoa. In the year 1536, in passing by sea to his bishopric, he was lost with his ship. This prelate revised and edited the treatise written by Porchetti, entitled "Victoria adversus impios Judæos." Some time after his

death, were published his "Annals of the Republic of Genoa," from the foundation of the city, to the year 1528: this work is highly esteemed for its information, and for the veracity of the facts. Moreri.

GIUSTINIANI, BERNARD, a Venetian nobleman, born in 1408, was educated under the most learned persons of his time, and obtained a high celebrity for his own knowledge and eloquence. He was employed on several honourable occasions by the republic. In 1451 he was appointed to receive the emperor Frederic III. when he passed through the Venetian territories. He was afterwards selected as a fit person to be sent on embassies to Ferdinand, king of Naples, to several of the popes, and to Lewis XI. king of France, who honoured him with knight-hood. In 1467 he was made captain commandant of Padua, and admitted to almost all the honours of the state, and finally procurator of St. Mark. He died in 1489. He was author of many works: as public orations: the life of his uncle "The blessed Lorenzo Giustiniani;" three pieces on the life, the translation, and the appearance of St. Mark: a version of the book of Socrates to Nicocles: some Latin letters of his father Leonardo; and the ancient history of Venice, written in Latin. This last was translated into Italian by Lodov. Domenichi. It was the work of his old age, but is highly esteemed, because the authorities are drawn from the best sources, and the author rejects the fables handed down by some other writers. Moreri.

GIZÉ, GIZAH, or *Siza*, in *Geography*, a considerable town of Egypt, extending along the west bank of the Nile, on the other side of the island of Roudda, or Raonda, with respect to Cairo; 3 miles S. W. of Cairo. This town was fortified by Ismail Bey, who also built a palace there, completed and since inhabited by Murad Bey, who has established a cannon foundry. Here is also a manufacture of sal ammoniac. The walls of Gizé are of great extent, and have only one gate to the country; they are ten feet high, three feet thick, and have six half-moons; but are only fit to resist cavalry, the original intention in raising them. Murad Bey has suffered the iron-work about the loop-holes to be plundered or ruined. The palace is in the southern quarter of the city, close to the water; it has numerous apartments for the Mamluks, and every convenience for ease or luxury. Murad Bey has, of late years, thought it necessary to institute a marine; having purchased some vessels of the Europeans, and built three or four others. The largest of these vessels carries 24 guns; those that are occasionally moored before Gizé cannot be navigated hence, except during the time of the Nile's increase. The mariners are chiefly Greeks of the Archipelago. Not far south of Gizé is "Geziret-el-dahab," a small island, which Diodorus Siculus denominated "Venus Aurea." N. E. of the city are gardens, and some spacious houses, occupied by the affluent and great, who occasionally leave the city to amuse themselves in this retreat; and they have there an open space where the Mamluks perform their military evolutions, and exercise their horses. The ground under the mountains to the east is filled with tombs. The mountain is of white sand and calcareous stone, and destitute of verdure. The numerous date-trees by which Gizé is surrounded, interspersed with the lofty turrets of the mosques, and the river, whose waves wash the very foundation of the houses, give it, at a distance, a very pleasing aspect. Dr. Shaw is of opinion, that the ancient Memphis stood on the site of Gizé; but this is disputed by Savary and others. (See MEMPHIS.) This is the nearest spot, says Sonnini, to the most valuable monuments which ancient Egypt has left behind of her glory and her power. The nearest pyramids are at the distance of three leagues, and they are indiscrimi-

nately called the "Pillars of Memphis," or the "Pillars of Gizeh." This town was taken from the French by the British in June, 1801. Brown's Travels in Africa; Savary's Letters on Egypt, vol. i. Bonini's Travels in Upper and Lower Egypt.

GIZIGUNSKAIA, a gulf at the N. W. extremity of the Pensinokoi sea, extending about 50 miles in length, and 16 in breadth. N. lat. 67 to 68. E. long. 165 14'.

GIZZARD of BIRDS. See *Anatomy of BIRDS*.

GIZZIELLO, GIOACHINO, CONTI, in *Biography*, one of the greatest Italian singers of the last century, arrived in England in 1756, as Handel's first singer, at the time that he had quitted the Royal Academy in the Haymarket, upon a quarrel with Senesino, and set up for himself at the new theatre in Covent Garden. The nobility and gentry who seem to have abetted Senesino, engaged for the opera in the Haymarket Porpora as a composer, and Farinelli, Cuzzoni, and a complete company of vocal and instrumental performers to oppose him. Handel, May 5th, opened his summer campaign with the revival of "Ariodante," an opera of the preceding year.

The next day the following eulogium on his new singer was inserted in the Daily Post: "last night Signor Gioachino Conti Gizziello, who made his first appearance in the opera of "Ariodante," met with an uncommon reception; and in justice both to his voice and judgment, he may be truly esteemed one of the best performers in this kingdom." Neither his friends nor the friends of Handel could venture to say more, while Farinelli was in the kingdom. Conti was at this time a young singer, more of promising, than mature abilities; and so modest and diffident, that when he first heard Farinelli, at a private rehearsal, he burst into tears, and fainted away with despondency. He had his cognomen of Gizziello from his master Gizzi, once an eminent stage singer, who, in his old age, became an excellent master.

The next opera in which Conti appeared, was "Atalanta," composed as an epithalamium on the marriage of his royal highness Frederic prince of Wales, with her serene highness the princess of Saxe-Gotha.

The songs in "Atalanta," which Handel composed expressly for his new singer, Conti, seem, upon examination, to have been written in his new, graceful, and pathetic style of singing. The bass and accompaniments, too, are of a modern cast, and, except the doses and two or three of the divisions, the whole seems of the present age.

Handel, never till now, had a first man to write for with so high a soprano voice. Nicolini, Senesino, and Carestini, were all contraltos. There was often dignity and spirit in their style; but Conti had delicacy and tenderness, with the accumulated refinements of near thirty years, from the time of Handel's first tour to Italy. We think it is not difficult to discover, particularly in the first act, that in composing Conti's part in this opera, he modelled his melody to the school of his new singer. Indeed, Handel was always remarkably judicious in writing to the taste and talents of his performers in displaying excellence, and covering imperfections.

While Conti was his first male singer, and the Strada his first woman, he revived his opera of "Alcina and Paramond," and composed his part in the opera of "Arminio," expressly to display his peculiar talents; in the airs of which it seems as if Handel had more basses and accompaniments in iterated notes, than in any preceding work.

He was advancing rapidly in the modern style of opera songs when he quitted the stage, and retreated back to a more solemn and solid style for the church.

It is chiefly in writing for Conti and Anibali that the conformity to a different style from his own appears.

DOMENICO ANNIBALI, who should have had an article in the letter A, had he been remembered, shall be characterized here, in apology for the omission. His first air in the opera of "Arminio," in which he performed with Conti and the Strada, discovers his voice to have been a contralto, which Handel gave him an opportunity to display by a swell, *ad libitum*, at the beginning; but no peculiar taste, expression, or powers of execution, appear in his part; his bravura air in the second act, *Si cadde*, contains only common and easy passages. His abilities during his stay in England seem to have made no deep impression, as we never remember him to have been mentioned by those who constantly attended the operas of those times, and were rapturists in speaking of the pleasure which they had received from singers of the first class. But to return to Conti, who, after he quitted England, studied with such diligence, that being engaged at Madrid to sing in the operas under the direction of Farinelli, he turned the tables on that wonderful singer, in whom it has been said, that he excited envy by his new and refined taste and pathos.

He was one of the constellation of great singers which the king of Portugal had assembled together in 1755.

There were, according to Pacheco's account, Elisi, Manzoli, Catarrli, Gizziello, Veroli, Babbì, Luciani, Raaf, Ruina, and Guadagni. No females were then allowed to appear on the opera stage in Portugal. Gizziello, narrowly escaping with his life during the dreadful earthquake which happened at Lisbon that year, was impressed with such a religious turn by that tremendous calamity, that he retreated to a monastery, where he ended his days. It was soon after this event, that Guadagni shut himself up in the same convent not so much for spiritual consolation as musical counsel; which he so effectually obtained from the friendship of Gizziello, that from a young and wild singer of the second and third class, he became, in many respects, the first singer of his time.

GLABALK, in *Geography*, a town of France, in the department of the Dyle, and chief place of a canton, in the district of Louvain. The place contains 239, and the canton 6771 inhabitants, on a territory of 120 kilometres, in 19 communes.

GLABELLA, in *Anatomy*, from *glaber*, smooth; the space between the two eye-brows, which is ordinarily not covered with hairs.

GLABER, in *Biography*, a Benedictine monk, who flourished in the 11th century, and who has rendered his name memorable by a "Chronicle or History of France," written in the Latin language. It consists of five books, of which the first relates to the events of the monarchy previously to Hugh Capet; and the four subsequent ones to those following it, as far down as the year 1046. This work is defective as a composition, and, at the same time, full of fabulous stories, yet it contains much valuable information relative to those remote ages. He was author of a life of William, abbot of St. Benignus at Dijon. Morei.

GLABRARIA, in *Botany*, so denominated by Linnaeus, on account of the smooth, shining, silky appearance of its wood. Linn. Mant. 156. Schreb. 515. Willd. Sp. Pl. v. 3. 1433. Mart. Mill. Dict. v. 2. Juss. 433. Lamarck, Illustr. t. 640. Class and order, *Monadelphica Polyandria*. Nat. Ord. "uncertain; perhaps akin to *Styrax*." Juss. Rather *Malvacea*, near *Dario*.

Gen. Ch. Cal. Perianth inferior, of one leaf, tubular half as long as the corolla, cut half way down into five equal obtuse

obtusè, broadish teeth. *Cor.* Petals five, lanceolate, obtuse, equal. Nectary surrounding the germen, and consisting of five awl-shaped, erect, coloured bodies, the length of the calyx. *Stam.* Filaments thirty, capillary, the length of the calyx, united by their base into five parcels of six filaments each, ranged alternately with the nectaries; anthers kidney-shaped. *Pist.* Germen superior, nearly globular, four-lobed; style thread-shaped, as long as the stamens; stigma simple. *Peric.* according to Rumphius, a mucilaginous *drupa*, of one cell, containing a hard oval nut.

*Eff. Ch.* Calyx tubular, five-cleft. Petals five. Nectary of five bristles, alternate with the parcels of stamens. Style one. Stamens thirty, in five parcels. *Drupa.*

1. *G. terfa.* Linn. Mant. 276. (*Lignum leve minus*; Rumph. Amb. v. 3. 71. t. 44.) Native of the lofty and close woods of Amboyna. Rumphius describes and figures two kinds of his *Lignum leve*, very similar to each other, nor does it appear on what authority Linnaeus adopted one as a synonym in preference to the other. The specimens in his herbarium have slender leafy *branches*, with a smooth greyish bark. *Leaves* alternate, on short thick stalks, ovate-lanceolate, pointed, entire, three or four inches long, veiny; smooth and shining above; pale grey beneath, as if hoary; but they are rather clothed with a silvery fealy skin, minutely dotted all over, which soon leaves the rib and veins. *Stipulas* none. *Flower-stalks* axillary and terminal, branched irregularly, the partial ones somewhat umbellate, all clothed, as well as the calyx, with minute umbilicated rusty scales, exactly like those on the leaves and stalks of the *Durio*; see that article. The *flowers* are small. *Fruit*, according to Rumphius, an aromatic black *drupa*, the size of a pea, standing on the permanent calyx.

If the *Durio* belongs to *Malvaceæ*, we are persuaded this genus must likewise be placed in that order, but otherwise we should have had no such idea, nor does the fruit confirm it. The light fibrous silky nature of the wood, which while wet is close, but has large fissures when exposed to the sun, favours our supposition.

**GLACIALIS.** *tev.* of *glacis*, *ice*, something relating to ice; and particularly a place that abounds in ice.

Thus we say, the *Mare Glaciale*, or *Congelatum*, that is, the Icy or Frozen sea; called also the Chronian or Sarmatian sea.

**GLACIERS**, a denomination applied to large sheets or fields of ice among the Alps, and which are numerous in Switzerland and Savoy. Of these there are five, that stretch towards the plain of Chamouny, and unite at the foot of Mont Blanc; they are called Tacona, Bossons, Montanvert, Argentiere, and Tour. The origin of these glaciers, extending into fields of corn and pasture, and lying, without being melted, in a situation where the heat of the sun is powerful enough to bring vegetation to maturity, is a very curious subject of investigation. Mr. Coxe has given us an abstract of the theory of Gruner, with regard to their formation, and other particulars respecting them, confirmed and amended by that able naturalist Saussure; which appears, upon the whole, to be the most simple and natural. If a person, says this interesting traveller, could be conveyed to such an elevation as to embrace, at one view, the Alps of Switzerland, Savoy, and Dauphiné, he would behold a vast chaos of mountains, intersected by numerous vallies, and composed of many parallel chains, the highest occupying the centre, and the others gradually diminishing in proportion to their distance. The most elevated, or central chain, would appear bristled with pointed rocks, and covered, even in summer, with ice and snow, in all parts that are not perpendicular. On each side of this chain he

would discover deep vallies clothed with verdure, peopled with innumerable villages, and watered by many rivers. In considering these objects with greater attention, he would remark, that the central chain is composed of elevated peaks and diverging ridges, whose summits are overtopped with snow; that the declivities of the peaks and ridges, excepting those parts that are extremely steep, are covered with snow and ice, and that the intermediate depths and spaces between are filled with manife fields of ice, terminating in those cultivated vallies which border the great chain. In pursuing this general survey, and moreover observing that the branches most contiguous to the central chain would present the same phenomena, only in a lesser degree; the glaciers would be obviously divided into two sorts; the first occupying the deep vallies situated in the bosom of the Alps, and termed by the natives "Vallées de Glace," distinguished by Mr. Coxe by the name of "Lower Glaciers;" the second, which clothe the summits and sides of the mountain, are denominated "Upper Glaciers."

The former are much the most considerable in extent and depth. Some stretch several leagues; that of Des Bois in particular is more than 15 miles long, and above three in its greatest breadth. These lower glaciers do not communicate with one another, and few of them are parallel to the central chain. They mostly stretch in a transverse direction, being bordered at the higher extremity by inaccessible rocks, and on the other extending into the cultivated vallies. Saussure found the general depth of the ice in the glacier des Bois from 80 to 100 feet; but there is reason to believe that its thickness in some places exceeds even 600 feet. These immense fields of ice usually rest on an inclined plane; being pushed forwards by the pressure of their own weight, and weakly supported by the rugged rocks beneath, they are intersected by large transverse chasms, and present the appearance of walls, pyramids, and other fantastic shapes, observed at all heights and in all situations, wherever the declivity exceeds 30 or 40 degrees. But in those parts, where the plane on which they rest is nearly horizontal, or gently inclined, the surface of the ice is nearly uniform; the chasms are few and narrow, and they are crossed without much difficulty. The surface of the ice is less slippery than that of ponds or rivers; it is rough and granulated, and only dangerous to those who pass it in steep descents. It is not transparent, is very porous, and full of small bubbles, and is of course less compact than common ice. Its perfect resemblance to the congelation of snow impregnated with water, in opacity, roughness, and the number as well as smallness of the air-bubbles, led Saussure to conceive the following simple and natural theory concerning the formation of the glaciers. An immense quantity of snow continually accumulates in the elevated vallies which surround the Alps, as well from that which falls from the clouds during nine months in the year, as from the mists incessantly rolling from the steep sides of the circuitous mountains. Part of this snow, not dissolved during summer, impregnated with rain and snow-water, is frozen during winter, and forms that opaque and porous ice of which the "Lower Glaciers" are composed. The "Upper Glaciers" may be subdivided into those which cover the summits, and those which extend along the sides of the Alps. The former owe their origin to the snow that falls at all seasons of the year, and which remains nearly in its primitive state, being condensed into a hard substance, and not converted into ice. The substance which clothes the sides of the Alps is neither pure snow, like that of the summits, nor ice which forms the Lower Glaciers, but an assemblage of both. It contains less snow than the summits; because the summer heat

has more power to dissolve it, and because the liquefied snow descending from above, the mass absorbs a larger quantity of water. It contains more snow than the Lower Glaciers, because the dissolution of the snow is comparatively less. Hence the ice is even more porous, opaque, less compact than that of the Lower Glaciers, and of so doubtful a texture, as renders it, in many parts, difficult to decide, whether it may be called ice or frozen snow. In a word, there is a regular gradation from the snow on the summits to the ice of the Lower Glaciers, formed by the intermediate mixture, which becomes more compact and less porous in proportion as it approaches the Lower Glaciers, until it unites and assimilates with them. And it is evident, that the greater or lesser degree of density is derived from the greater or lesser quantity of water, with which the mass is impregnated.

It has been a contested point among naturalists, whether the glaciers are in a state of increase or diminution. The following observations may be alleged in proof of the latter alternative. In 1785, the inferior glacier of Grindelwald was diminished at least 400 yards since the year 1776; in the valley of Chamouny, the glaciers called "les murailles de glace," from their resemblance to walls, and which rise in very thick, solid, parallel ranges to a height of 150, or, as some say, 400 feet above their real base, and forming the border of the glacier of Boffoa, no longer existed, and young trees had shot up in the parts which were then covered by the glaciers of Montanvert. The advocates for the increase of the glaciers, notwithstanding these facts, applicable, as they say, to the lower regions, assert, both from theory and observation, that more snow falls, and more ice is annually formed in the Alps than can be annually dissolved. From theory they argue, that the cold occasioned by the mass of ice already formed ought to augment it still further: and from experience they deduce, that within the remembrance of the present generation, many mountains have been covered, many pastures and habitations invaded, and many passages irrecoverably obstructed by the ice. In reply to the argument from theory it is maintained, that the causes which lead to the diminution of the ice are no less powerful than the augmentation of the cold, which is supposed to occasion its indefinite increase. These causes are principally rain and sleet in the less elevated regions, evaporation, descent of the snow and ice, both precipitous and gradual, heat of the atmosphere, and mean temperature of the earth, which is always above the freezing point, as is evident from the heat of the springs which issue from the bowels of the earth. With regard to the argument derived from experience, it is thought sufficient to observe, that while the facts that prove the progress of the ice are admitted, it by no means seems to follow, that its mass is perpetually increasing. For the advocates of this opinion, while they scrupulously enumerate the places which have been invaded by the ice, do not take notice of these parts, no less numerous, from which the ice has receded. Upon the whole we have reason to conclude, that if the collection of ice and snow gains in some places, it is diminished in others, and that, upon an average, the aggregate quantity is nearly the same. Cox's Travels in Switzerland, vol. ii.

GLACIES MARIE. See SPECULARIS *Japis*.

GLACIS, in *Building*, an easy insensible slope or declivity. The descent or inclination of the glacis is less steep than that of the talut. In gardening a descent sometimes begins in talut, and ends in glacis.

The glacis of the corniche is an easy imperceptible slope in the cymatum of the corniche, to promote the descent and carrying off of the rain-water.

GLACIS, in *Fortification*, is particularly used for that of the counterescarp, being a sloping bank, which reaches from the parapet of the counterescarp, or covert-way, to the level side of the field, at the distance of about twenty fathom.

The construction of the covert-way and glacis is more distinctly illustrated in *Plate V. Fortification, fig. 6*. When the body of the place, and all the necessary out-works are constructed, lines are drawn parallel to the outermost counterescarp of the ditches, at six toises distant from it; and the space *m n m n*, included between that line and the counterescarp, will be the covert-way required. If lines are drawn parallel to the lines which terminate the covert-way, and the places of arms *m, m*, &c. at twenty toises distant from them, the space *x x x* between these lines will be the glacis. *A*, in this figure, represents the arrow; *B*, the detached redoubt; *v, v*, the traverses; *z, z*, the sally-ports. When the ground is low, and water to be found, there is often a ditch of about ten or twelve toises made round the glacis; beyond which there is a second covert-way of four toises, with traverses and places of arms, and a second glacis from fifteen to eight or ten toises broad. Muller's Fort p. 42. See *Military CONSTRUCTION*.

GLADBACK, or GLADRACH, in *Geography*, a town of Germany, in the circle of Westphalia, and duchy of Juliers; 16 miles N. of Juliers. N. lat. 51 14'. E. long. 6 15'.

GLADDON, or GLADWIN, the name of a plant, otherwise called spurge-wort.

GLADE, in *Agriculture, Gardening, &c.* a vista, or open and light passage made through a thick wood, grove, or the like, by lopping off the branches of trees along the way.

GLADE, in *Zoology*. See GLEAD.

GLADENBACH, in *Geography*, a town of Germany, in the principality of Upper Hesse; 12 miles N. of Gießen.

GLADIATORS, in *Antiquity*, persons who were retained to fight ordinarily in the arena, for the entertainment of the people.

The gladiators were usually slaves, and condemned criminals, who fought from necessity; though, sometimes, freemen made profession of this practice, like our prize-fighters, for a livelihood. After a slave had served on the arena three years, he was dismissed.

The Romans borrowed this cruel diversion from the Asiatics: some suppose that there was policy in this practice, the frequent combats of gladiators tending to accustom the people to despise danger and death.

The origin of such combats seems to be as follows: From the earliest times with which we have any acquaintance with profane history, it had been the custom to sacrifice captives, or prisoners of war, to the manes of the great men who had died in the engagement; thus Achilles, in the *Iliad*, lib. xxiii. sacrifices twelve young Trojans to the manes of Patroclus; and in *Virgil*, lib. xi. ver. 81. Æneas sends captives to Evander, to be sacrificed at the funeral of his son Pallas.

In course of time they came also to sacrifice slaves at the funerals of all persons of condition; this was even esteemed a necessary part of the ceremony; but, as it would have appeared barbarous to have massacred them like beasts, they were appointed to fight with each other, and endeavour to save their own lives by killing their adversaries. This seemed somewhat less inhuman, because there was a possibility of avoiding death by an exertion of skill and courage.



## GLADIATORS.

This occasioned the profession of gladiator to become an art; hence arose masters of arms, and men learned to fight and exercise this art.

These masters, whom the Latins called *lanista*, bought slaves to be trained up to this cruel trade, whom they afterwards sold to such as had occasion to present the people with so horrible a show.

They were at first performed near the sepulchre of the deceased, or about the funeral pile, but were afterwards removed to the circus and amphitheatres, and became ordinary amusements. See BUSTUARI.

The first show of gladiators, called *munus gladiatorum*, was exhibited at Rome, according to Valerius Maximus, by M. and D. Brutus, upon the death of their father, in the year of the city 488; though Livy (ix. 40.) speaks of it in the 444th year of Rome, as practised among the Campanians. On the exhibition by M. and D. Brutus, there were probably only three pairs of gladiators: in the year of Rome 537, the three sons of M. Emilius Lepidus the augur, who had been three times consul, entertained the people with the cruel pleasure of seeing twenty-two gladiators fight in the forum; and the show continued three days. In the year of Rome 547, the first Africanus diverted his army at New Carthage with a show of gladiators, which he exhibited in honour of his father and uncle, who had begun the reduction of Spain. In the 552d year the sons of M. Valerius Lavinus exhibited 25 pairs of gladiators; and in 569, 70, and in 578, 74 fought on the like occasion. In process of time, the Romans became so fond of these bloody entertainments, that not only the heir of any great and rich citizen lately deceased, but all the principal magistrates, presented the people with shows of this nature, to procure their affection. The aediles, praetors, consuls, and, above all, the candidates for offices, made their court to the people, by entertaining them frequently with these fights: and the priests were sometimes the exhibitors of the barbarous shows; for we meet with the *ludi pontificales* in Suetonius, August. cap. 44. and with the *ludi sacerdotales*, in Pliny, Epist. lib. vii. As for the emperors, it was so much their interest to ingratiate themselves with the populace, that they obliged them with combats of gladiators almost upon all occasions, and as these increased, the number of combatants increased likewise. Accordingly, Julius Cæsar, in his aedileship, diverted the people with three hundred and twenty couple. Gordian, before he was emperor, gave these shows twelve times in a year. In some of these there were 500 pairs of gladiators, and never less than 50.

Germanicus and Claudius, both sons of Drusus, gave combats of gladiators in honour of their father. Nero's and Domitian's combats of gladiators are noticed in the sequel of this article. Otho employed 2000 gladiators in the war against Vitellius (A. D. 69), and Vitellius hired gladiators to fight in all the streets of Rome for the amusement of the people. The inhuman fights of gladiators, though long authorized by custom, afforded no pleasure to Vespasian. Titus, however, exhibited a show of gladiators, wild beasts, and representations of sea-fights, which lasted a hundred days; and Trajan continued a solemnity of this nature for a hundred and twenty-three days, during which time he brought out ten thousand gladiators. And Adrian, on his first visit to Rome, after his promotion to the empire, gave combats of gladiators for six days successively. Before this time, under the republic, the number of gladiators was so great, that when the conspiracy of Catiline broke out, the senate ordered them to be dispersed into the garrison and secured, lest they should have joined the disaffected party. See GLADIATORS' War.

These sports were become so common, and their consequences, in a variety of respects, so dangerous, that Cicero preferred a law, that no person should exhibit a show of gladiators within two years before he appeared candidate for any office. Julius Cæsar ordered, that only a certain number of men of this profession should be in Rome at a time. Augustus decreed, that only two shows of gladiators should be presented in a year, and never above sixty couple of combatants in a show. And Tiberius provided by an order of senate that no person should have the privilege of gratifying the people with such a solemnity, unless he was worth four hundred thousand sesterces. They were also considerably regulated by Nerva.

The emperor Claudius restrained them to certain occasions; but he soon afterwards annulled what he decreed, and private persons began to exhibit them at pleasure, as usual: and some carried the brutal satisfaction so far, as to have them at their ordinary feasts.

And not slaves only, but other persons, would hire themselves to this infamous office.

The master of the gladiators made them all first swear, that they would fight to death; and if they failed, they were put to death, either by fire, or swords, clubs, whips, or the like.

It was a crime for the wretches to complain when they were wounded, or ask for death, or seek to avoid it, when overcome; but it was usual for the emperor, or the people, to grant them life, when they gave no signs of fear, but waited the fatal stroke with courage and intrepidity: Augustus even decreed, that it should always be granted them. But fear and want of spirit were very rare on occasions of this kind; inasmuch, that Cicero more than once proposes the principle of honour which actuated the gladiators as an admirable model of courage and constancy; by which he intended to animate himself and others, to suffer every thing for the preservation of liberty and the defence of the commonwealth. (Tusc. ii. 41. Philip. ii. 35.)

From slaves and freedmen, the inhuman sport at length spread to people of rank and condition; so that Augustus was obliged to issue a public edict, that none of the senatorian order should become gladiators; and soon after he laid the same restraint on the knights; nevertheless, Nero is related to have brought upwards of four hundred senators, and six hundred Roman knights upon the arena; though Lipsius takes both these numbers to be falsified, and, not without reason, reduces them to forty senators, and sixty knights. Not only senators, but even women of quality, fought in public in some of Nero's combats of gladiators. On occasion of the triumph of Probus, A. D. 281, about fourscore gladiators, together with near 600 others, exhibited the most desperate courage, for the inhuman sports of the amphitheatre. Disdaining to shed their blood for the amusement of the populace, they killed their keepers, broke from the place of their confinement, and filled the streets of Rome with blood and confusion. After an obstinate resistance, they were overpowered and cut in pieces by the regular forces; but they obtained at least an honourable death, and the satisfaction of a just revenge (Zosimus, l. i. p. 66.): yet Domitian, that cruel monster of cruelty, retired upon Nero, exhibiting combats of women in the night-time.

Before Rome was become the capital of the known world, Antiochus Epiphanes, king of Syria, in imitation of the Romans, had introduced the combats of gladiators in his dominions. It is remarkable, however, that the Athenians, who were naturally beneficent and humane,

## GLADIATORS.

never admitted bloody shows into their city: and when it was proposed to establish combats of gladiators there, in order not to give place in that respect to the Corinthians, "First throw down," exclaimed an Athenian in the midst of the assembly, whose name was Demomax, a famous philosopher, who flourished in the reign of Marcus Aurelius. "The altar which our forefathers above a thousand years ago erected to Mercury."

Some Pagan emperors, lamenting the sad effects of this savage custom, endeavoured, as we have already seen, to moderate it. With this view Marcus Aurelius retrenched the enormous expences employed in these combats, and would not suffer the gladiators to fight with each other, except with very blunt swords, like foils; so that they might shew their address, without any danger of being killed. But the honour of suppressing these combats was reserved for Christianity; and it cost many efforts and much time to effect this purpose: so rooted was the evil, and so much had it established itself by the long prescription of many ages, and the opinion of the world, that these combats were acceptable to the gods, to whom, for that reason, they offered the blood of gladiators lately shed, by way of sacrifice, as several of the Christian fathers observe.

Constantine the Great is said to have first prohibited the combats of gladiators in the East; at least, he forbade those who were condemned to death for their crimes to be employed; there being an order still extant to the præfectus prætorii, rather to send them to work in the mines in lieu thereof; it is dated at Berytus, in Phœnicia, the 1st of October, 325.

But, notwithstanding this edict, which condemned the art and amusement of shedding human blood, the benevolent law expressed the wishes of the prince, without reforming an inveterate abuse, which degraded a civilized nation below the condition of savage cannibals. Several hundred, perhaps several thousand, victims were annually slaughtered in the great cities of the empire; and the month of December, more peculiarly devoted to the combats of gladiators, still exhibited to the eyes of the human people a grateful spectacle of blood and cruelty. Amidst the general joy of the victory at Pollentia, gained by the emperor Honorius, Prudentius, a Christian poet, exhorted the emperor to extirpate, by his authority, the horrid custom which had so long defiled the voice of humanity and religion. The pathetic representations of Prudentius were less effectual than the generous boldness of Telemachus, an Asiatic monk, whose death was more useful to mankind than his life. The Romans were provoked by the interruption of their pleasures; and the rash monk, who had descended into the arena, to separate the gladiators, was overwhelmed under a shower of stones. But the madness of the people soon subsided; they respected the memory of Telemachus, who had deserved the honours of martyrdom; and they submitted, without a murmur, to the laws of Honorius, which abolished for ever the inhuman sacrifices of the amphitheatre. The citizens, who adhered to the manners of their ancestors, might perhaps insinuate, that the last remains of a martial spirit were preserved in this school of fortitude, which accustomed the Romans to the sight of blood, and to the contempt of death:—a vain and cruel prejudice, so nobly confuted by the valour of ancient Greece, and of modern Europe.

It must be observed, however, that the practice was not entirely abolished in the West before Theodoric, king of the Ostrogoths. Honorius, on the occasion first mentioned, had prohibited them; but the prohibition does not seem to have been executed. Theodoric, in the year 500, abolished them finally.

Some time before the day of battle, the person who presented the people with the shows gave them notice thereof, by programmas, or bills, containing the names of the gladiators, and the marks whereby they were to be distinguished; for each had his several badge, which was, most commonly, a peacock's feather, as appears, from the Scholiast of Juvenal, on the 158th verse of the third Satire, and Turnebus Advers. lib. ii. cap. 8.

They also gave notice what time the shows would last, and how many couples of gladiators there were; and it even appears, from the 52d verse of the seventh Satire of the second book of Horace, that they sometimes made representations of these things in painting, as is practised among us by those who have any thing to show at fairs.

The day being come, they began the entertainments by bringing two kinds of weapons; the first were slaves, or wooden files, called *rudis*; and the second were effective weapons, as swords, poniards, &c.

The first were called *arma lusoria*, or *exercitoria*; the second *decretoria*, as being given by decree or sentence of the prætor, or of him at whose expence the spectacle was exhibited. They began to fence or skirmish with the first, which was to be the prelude to the battle; and from these, when well warmed, they advanced to the second, at the sound of the trumpets, with which they fought naked.

Then they were said *vertere arma*; the terms of striking were *petere* and *repetere*; of avoiding a blow, *evitare*; and when one of the combatants received a remarkable wound, his adversary or the people cried out, *habet*, or *hoc habet*. The first part of the engagement was called *ventilare*, *prælidere*; and the second, *dnicare ad certum*, or *versis armis pugnare*; and some authors think, with much probability, that it is to these two kinds of combat that St. Paul alludes, in the passage 1 Cor. ix. 26, 27. "I fight, not as one that beateth the air; but I keep my body, and bring it into subjection."

If the vanquished surrendered his arms, it was not in the victor's power to grant him life; it was the people during the time of the republic, and the prince or people during the time of the empire, that were alone impowered to grant the boon.

The reward of the conqueror was a branch of palm-tree, and a sum of money, probably collected among the spectators; sometimes they gave him his congé, or dismissed him, by putting one of the wooden foils or *rudis* in his hand; and sometimes they even gave him his freedom, putting the pileus on his head.

The sign or indication whereby the spectators shewed that they granted the favour, was *prostrare pollicem*, which M. Dacier takes to be a clenching of the fingers of both hands between one another, and so holding the two thumbs upright, close together; and, when they would have the combat finished, and the vanquished slain, they *verterunt pollicem*, bent back the thumb; which we learn from Juvenal, Sat. iii. ver. 36.

"Mura nunc edant, et verso pollice vulgi  
Quemlibet occidunt populariter." Juv.

The gladiators challenged or defied each other, by shewing the little finger; and, by extending this, or some other, during the combat, they owned themselves vanquished, and begged mercy from the people. "Vidi ostensam digiti venian a populo postulant," says the old Scholiast on Persius. Vide Phir. lib. xxviii. cap. 2. Prudentius, lib. ii. contra Symm. ver. 1098. Horace, lib. iv. 18. ver. 66.

Politian.

Politian. Miscel. cap. 42. Turneb. Advers. lib. xi. cap. 6. Lip. Saturn. lib. ii. cap. 22.

There were divers kinds of gladiators, distinguished by their weapons, manner, and time of fighting, &c. as,

The *andabata*, of whom we have already given an account under *ANDABATÆ*.

The *cateruarii*, who always fought in troops or companies, number against number; or according to others, who fought promiscuously, without any certain order. Lipf lib. ii. cap. 16.

The *consummati*, whom authors mention as a species of gladiators, the same with the *rudarii* and *veterani*; founding the opinion on a passage in Pliny, lib. viii. cap. 7. But Lipsius shews, that they have mistaken Pliny. Saturn. lib. ii. cap. 16. and Turneb. Advers. lib. xxx. cap. 36.

The *cubicularii*, which are a little precarious, being chiefly founded on a passage in Lampridius, in the life of the emperor Commodus: "Inter hæc, habitu victimarii, victimas immolavit, in arena rudibus, inter cubicularios; gladiatores pugnavit lucentibus aliquando mucronibus."

Turnebus reads *rudiaris* instead of *cubicularios*: and understands it of those who had been dismissed, and could no longer be obliged to fight, except with foils.

Salmasius reads *gladiator*; and refers it to the emperor, who fought not only on the arena, and with foils, or blunted instruments, but at home, with his servants and valets de chambre, and with sharps.

Lipsius will have nothing altered in the text: the *gladiatores cubicularii*, he observes, were those who fought at private houses, during feasts, &c. Accordingly, Dion says expressly, that Commodus sometimes fought at home, and even killed some persons in such rencounters; but that, in public, he only fought with blunted weapons.

The *dimache*, who fought armed with two poniards, or swords; or with sword or dagger. Lipf. Saturn. lib. ii. cap. 13.

The *effedarii*, who fought in cars; called also, in an inscription lately discovered at Lyons, *affedarii*. Saturn. ferm. lib. ii. cap. 13.

The *ficales*, or *Cæsariani*, who belonged to the emperor's company; and who, being more robust and dexterous than the rest, were frequently called for, and therefore named also *postulatii*. Saturn. lib. ii. cap. 16.

The other kinds were, the *hoplœmachi*, *meridiani*, *myrmillones*, *ordinarii*, *pinnirapi*, *provocatores*, *retiarii*, *radiarii*, *Sannites*, *secutores*, *spectatores*, and *Thracæ*: which see described under *MERIDIANI*, *RETIARI*, *SECUTORES*, &c.

Some authors, and particularly Vigerene on Livy, rank the *obsequentes*, mentioned by Spartian, in his life of Marcus Aurelius, among the number of gladiators; Lipsius ridicules him, Saturn. lib. ii. cap. 10. and with some reason: the *obsequentes* properly were the troops which that emperor raised among the gladiators; or whom of gladiators he made soldiers.

*GLADIATORS' WAR*, *bellum Gladiatorum*, or *Spartæcum*, called also the *servile war*, was a war which the Romans sustained about the year of their city 680. Spartacus, Crispus, Oenomaus, having escaped, with other gladiators, to the number of seventy-four, out of the place where they had been kept at Capua, gathered together a body of slaves, put themselves at their head, rendered themselves masters of all Campania, and gained several victories over the Roman prætors. At length they were defeated, in the year 682, at the extremity of Italy; having, in vain, attempted to pass over into Sicily.

This war proved very formidable to the Romans.

Craſſus was not able to finish it: the great Pompey was forced to be sent as general.

*GLADIATORIA*, *ajing*, is a most valuable monument of ancient sculpture, which is now preserved in the palace of Chigi. This man, when he had received the mortal stroke, is particularly careful, *ut prœstaret bonæ*, that he might fall gracefully; he is seated in a reclining posture on the ground, and has just strength sufficient to support himself on his right arm; and in his expiring moments, it is plainly seen that he does not abandon himself to grief and dejection, but is desirous to maintain that firmness of aspect, which the gladiators valued themselves on preserving in this season of distress, and that attitude which they had learnt of the masters of defence. He fears not death, nor seems to betray any tokens of fear by his countenance, nor to shed one tear: "quis mediocris gladiator ingenuus, quis vultum mutavit unquam, quis non modo seta, verum etiam decubuit turpiter," says Cicero, in that part of his Tusculan, where he is describing the astonishing firmness of these persons. We see, in this instance, notwithstanding his remaining strength, that he has but a moment to live, and we view him with attention, that we may see him expire and fall: thus the ancients knew how to animate marble, and to give it almost every expression of life.

*GLADIOLÆ*, in *Botany*. See *BUTOMUS* and *LOBELIA*.

*GLADIOLUS*, a name in Pliny, from *gladius*, a sword, alluding to the form of the leaves. Linn. Gen. 26 Schreb. 35. Willd. Sp. Pl. v. 1. 208. Vahl. Enum. v. 2. 77. Thunb. Diff. n. 7. Ait. H. Kew ed 2. v. 1. 96. Ker in Ann. of Bot. v. 1. 230. Mart. Mill. Diet. v. 2. Juss. 58. Tourn. t. 100. Lamarek Illust. t. 32. Gertn. t. 11.—Class and order, *Triandria Monogynia*. Nat. Ord. *Enfate*, Linn. *Iridæ*, Juss.

Gen. Ch. *Cal.* Spatha inferior, shorter than the corolla, of two oblong permanent valves; the outermost larger, enclosing the inner one. *Cor.* of one petal, superior; tube cylindrical, swelling upwards, curved; limb somewhat bell-shaped, irregular, in six deep, oblong, slightly spreading, unequal segments, the upper and lowermost either without or within the lateral ones. *Stam.* Filaments three, inserted into the mouth of the tube, thread-shaped, ascending, shorter than the corolla; anthers ovate, incumbent. *Pist.* Germen inferior, triangular; style thread-shaped; stigma three, spreading, folded, recurved, obtuse, downy. *Peric.* Capsule ovate, triangular, obtuse, thin, of three cells and three valves. *Seed.* numerous, smooth, surrounded with a membranous wing.

Ess. Ch. Spatha of two valves. Corolla tubular; its limb in six deep segments, irregular. Stamens ascending. Stigmas three, dilated. Seeds winged.

Twenty-four species of this genus are defined in the 14th edition of Linnaeus's *Systema Vegetabilium*, of which the *reniformis*, Sp. Pl. 53, belongs, we believe, to *Lilia*, or some of its near allies. Willdenow makes 50 species, but Mr. Ker (late Gawler) has, we think, with great propriety, established the old genus *Wasserh.*, to which some of them are removed, while others go to his *Tritium* or elsewhere, so that he names but 28 species in Sims and König's Annals above quoted. He is followed by Mr. Dryander in the new edition of the *Herbarium Kewense*, except with regard to his *virgatus*, there called *trivifolius*, after Willdenow and Jacquin; while a most distinct species figured in Curt. Mag. t. 574, by Mr. Ker as a variety of *virgatus*, is properly retained as being the true *virgatus* itself. Five of Mr. Ker's species are not found in Hort. Kew.

We judge it necessary to give a view of the whole genus in

its reformed state, adding the Linnæan *G. imbricatus* to what the above-mentioned writers have defined.

1. *G. Cermani*. Gertn. v. 1. 31. (*Antholyza Cunonia*; Linn. Sp. Pl. 54. Vahl. Pflanz. v. 2. 121. Curt. Mag. t. 343. Redout. Lil. t. 12.)—Leaves linear-sword-shaped. Upper segment of the corolla very long; lower very small.—Native of the Cape of Good Hope, nor does it appear to grow, as Linnæus asserts, in Persia. It is remarkable for the vivid scarlet of its flag and beautiful *flowers*, the three upper segments of whose corolla are broadly elliptical and vaulted, the middlemost projecting far beyond the other two; while the three lower are very small and greenish. This is a hardy green-house plant. See ANTHOLYZA, n. 3.

2. *G. Wijnprins*. Thunb. Diff. 14. Prod. 8. Jacq. Coll. v. 3. 257. Ic. Rar. t. 233. Curt. Mag. t. 457 and 569. (*G. præcox*; Andr. Repof. t. 38.)—“Leaves linear-sword-shaped, with three ribs on each side. Tube of the corolla cylindrical, longer than the limb.”—Native of the Cape of Good Hope; almost hardy with us, flowering in April. The *corolla* is scarlet, sometimes speckled with yellow, as in Curtis’s t. 569; its segments are sharp-pointed, and nearly equal, each an inch long. Tube an inch and half in length, its base very narrow and throat-shaped.

3. *G. quadrangularis*. Ker in Curt. Mag. t. 567. (*G. abbreviatus*; Andr. Repof. t. 166. *Antholyza quadrangularis*; Burm. Fl. Cap. according to Mr. Ker.)—“Leaves with four angles and four furrows. Upper segment of the corolla very long; lower very small and sharp.”—Imported from the Cape of Good Hope, by those excellent cultivators Messrs. Lee and Kennedy in 1799. It first flowered with them in March 1801. The quadrangular *leaves* distinguished this from most others, except the *triflis*, n. 10, and *permeabilis*, n. 7; the *flowers* more agree with *G. Cunonia*, at least in their large vaulted upper segment, but all the lateral segments are extremely short, ovate and acute, the lowermost being the least of all. The tube is yellow streaked with orange; large segment of the limb purplish; all the rest variegated with dull green and brown. According to the Linnæan idea of hybrid species, this might be guessed to have originated from *G. Cunonia* impregnated by *G. triflis*.

4. *G. galeatus*. Andr. Repof. t. 122. (*G. namaquensis*; Ker in Curt. Mag. t. 592.)—Upper segment of the corolla vaulted; two lateral rhomboid; three lower pendulous, spatulate, blunt with a little point. Leaves coriaceous, obovate.—Native of the Namaqua country, a considerable distance from the Cape of Good Hope; easily propagated by seeds or offsets, and blowing freely. The *leaves* are very thick, many-ribbed, obovate, obtuse, curved or oblique. *Stem* low, bent or zig-zag, covered with *bristles* and *flowers*. The latter are large and showy, their three narrow drooping lower segments, each half green half scarlet, strikingly contrasted with the large broad upper ones, which are of a rich scarlet, green white and purple at the base. No authority can induce us to prefer such a specific name as *namaquensis*, it being contrary to rule as the name of a country, and so peculiarly barbarous in itself. The *G. galeatus* of Jacquin is *Sparaxis galata* of Ker.

5. *G. alatus*. Linn. Sp. Pl. 53. Herb. Linn. Andr. Repof. t. 8. Ker in Curt. Mag. t. 586.—Upper segment of the corolla obovate, recurved; two lateral rhomboid; three lower pendulous, spatulate, pointed. Leaves rigid, lanceolate.—Common about the Cape of Good Hope; easily increased by seeds or bulbs, but rarely flowering with us. Bears a considerable resemblance to the last in form and colour, but the *leaves* are narrower and very differently

shaped, the lower segments of the *corolla* more lanceolate, the upper one reflexed. Linnæus once called this species *labilis*, but his son changed it to *alatus*, in allusion to the wing-like lateral segments.

6. *G. vi cratus*. Ker in Curt. Mag. t. 688. (*G. alatus*; Jacq. Ic. Rar. t. 259. *G. orchidiflorus*; Andr. Repof. t. 241.)—Upper segment of the corolla spatulate, arched, incurved; two lateral rhomboid; three lower spatulate, pendulous, acute. Leaves straight, linear-sword-shaped.—Native of the Cape; rare in our collections. Plukenet’s rude figure, t. 224. f. 8, is supposed to belong to this species rather than to the last, for which it is quoted by Linnæus. This differs from the two preceding in having long erect narrow *leaves*, and *flowers* variegated with dull green and purple, which are deliciously fragrant. The *stem* is tall, and sometimes branched.

7. *G. permeabilis*. De la Roche Diff. 27. t. 2. Ker in Ann. of Bot. v. 1. 231.—Leaves awl-shaped, quadrangular, erect. Upper segment of the corolla broadest, vaulted, undulated; two lateral narrow-rhomboid; three lower spatulate, acute, recurved at the points.—Native of the Cape of Good Hope. We know it only by De la Roche’s figure and description. He says the *flowers* are of a very pale violet, diluted with purple and yellow. The name alludes to their being pervious between the segments, but this is not peculiar. That supposed variety of *triflis*, figured by Jacquin, Ic. Rar. t. 244, seems to be very near the present species.

8. *G. versicolor*. Ker in Curt. Mag. t. 1042 and 556. Andr. Repof. t. 19.—Leaves linear-sword-shaped, with three ribs on each side. Segments of the corolla longer than the tube, pointed, recurved.—Native of the Cape, from whence it was received by Messrs. Lee and Kennedy in 1794. Its *flowers* are among the largest of its genus, with peculiarly long undulated recurved segments, and are remarkable for changing colour several days successively. In the morning it is of a purplish brown, but becomes grey in the course of the day, and finally of a light blue in the evening. The most wonderful, and, as far as we know, unique circumstance, is, that the original brown hue returns in the course of the night, and this happens for nine or ten following days. There are moreover some varieties of colour observable in different plants, some assuming more of a yellow hue. It differs essentially from the following in having a sword-shaped, not a quadrangular, leaf.

9. *G. triflis*. Linn. Sp. Pl. 53. Ker in Curt. Mag. t. 272 and 1098. Jacq. Ic. Rar. t. 245 and 243. (*Lilio-gladiolus bifolius* et *biflorus*, *foliis quadrangulis*; Trew. Ehret. t. 39.)—Leaves with four angles and four furrows. Segments of the corolla nearly equal, pointed.—Frequent at the Cape, and not uncommon in our green-houses, where it is justly admired for its rich evening scent, like a pink, or a bergamot pear, especially in the most common or part-coloured variety, to which the first-quoted figures of Curtis and Jacquin refer. The deeply furrowed quadrangular *leaves*, like those of the Snake’s-head Iris, *tuberosa*, distinguish it clearly from the last, for which Mr. Ker, we presume by mistake, quotes Jacquin’s t. 245. He likewise cites and blames Trew’s Ehret as the yellowish variety, which is a fine plate, though rather too pink, of the part-coloured one.

10. *G. hyalinus*. Jacq. Ic. Rar. t. 242. Ker in Ann. of Bot. v. 1. 231. Willd. Sp. Pl. v. 1. 211.—Leaves linear, erect, the length of their sheaths. Segments of the corolla ovate, acute; the uppermost largest, erect.—Native of the Cape. Jacquin says it flowered with him in December. We do not find it in the Hortus Kewensis, nor Hortus

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Cantabrigiæ, nor have we seen any specimen. The short, upright, straight *leaves* are remarkable. The *flowers* are smaller than in the two last, scentless; the base of their segments semi-transparent, the extremities yellowish, striped and dotted with purple. The upper segment is by far the largest; the others gradually smaller, to the lower one, which is least of all. Tube funnel-shaped, semi-pellucid, very pale purple, as long as the largest segment.—Jacquin first called this species *striatus*: see Collect. v. 4. 170.

11. *G. trifidus*. Jacq. Ic. Rar. t. 248. Coll. v. 3. 255. and v. 4. 1. 2. 3. f. 1. Ker in Ann. of Bot. v. 1. 231.—Leaves linear, convoluted, smooth. Stem zig-zag. Segments of the corolla elliptical, bluish, nearly equal, shorter than the tube.—Native of the Cape. Jacquin, from whose figures alone we are acquainted with this plant, says it bloomed with him in November. The stem is span high, curved and zig-zag. *Flowers* one or two, yellowish, more or less variegated with pale purple, scentless, about an inch and half long.

12. *G. jelskii*. Thunb. Diff. 18. Linn. Suppl. 96. Ker in Ann. of Bot. v. 1. 231.—“Leaves linear-bristle-shaped. Corolla ringent. Stem branched.”—Native of the Cape of Good Hope. “Stem bearing many spikes of flowers; very rarely simple; upright, somewhat zig-zag, four inches high; branches round and erect. *Leaves* about three, linear-lanceous, the upper ones gradually shorter; the lowermost as tall as the stem. *Flowers* alternate, white, ringent; their tube scarcely longer than the spathe.” Thunb.

13. *G. gracilis*. Jacq. Ic. Rar. t. 246. Ker in Curt. Mag. t. 562.—Leaves linear, ribbed, deeply furrowed on each side, with a very slight midrib. Corolla somewhat bell-shaped; segments ovate, nearly equal.—Native of the Cape, easily cultivated with us, blooming in March or April. *Flowers* wavy, pale blue, more or less speckled with black and white on the two lower lateral segments; without scent. *Bulb* very small. *Stem* variously bent, slender, two or three feet high.

14. *G. recurvus*. Linn. Mant. 28. Ker in Curt. Mag. t. 578. (*G. carinatus*; Willd. Sp. Pl. v. 1. 211. Ker in Ann. of Bot. v. 1. 231. *G. punctatus*; Jacq. Ic. Rar. t. 247. *G. ringens*; Andr. Repos. t. 27 and 227. Redout. Liliac. t. 123. *G. alatus*; Schneev. Ic. t. 12.)—Leaves linear, flat; rib prominent on each side. Radical sheath speckled. Segments of the corolla nearly equal, ovate, recurved.—Native of the Cape, cultivated and badly figured by Miller, and now frequent in gardens, where it is valued for the fine violet fragrance of its blue and yellow blossoms, more than even for their beauty or size, which equals that of most species. The *leaves* have a strong rib, prominent on each side, and the first sheath from the root is curiously speckled with brown, like the stalks of *Arum Dracunculæ*. Thunberg confounded this and *gracilis* with *trifidus*.

15. *G. brevifolius*. Jacq. Ic. Rar. t. 229. Dryand in Ait. Hort. Kew. ed. 2. v. 1. 98. (*G. micatus*; Ker in Curt. Mag. t. 992; and 3; t. 727. *G. carneus*; Andr. Repos. t. 240.)—“Leaf of the barren bulb solitary, linear, slightly downy; of the flowering one scarcely any. Corolla somewhat ringent.”—Native of the Cape, readily cultivated and increased with us. The *flowers* are among the smaller sized, all leaning one way, variously tinged with pale purple or rose-colour, with some yellow; their three lower segments most speckled, and nearly of equal size, the uppermost one rather largest, vaulted, recurved at the summit. The *leaves* are minutely downy, upright, linear or slightly lanceolate; very short, or rather mere scales, on the

lower ring stem; solitary and larger on the bulb, which produces no flowers.

16. *G. bifidus*. Jacq. Ic. Rar. t. 250. Dryand in Ait. Hort. Kew. ed. 2. v. 1. 98. Ker in Curt. Mag. t. 574. (*G. carneus*; Andr. Repos. t. 11.)—“Leaves linear sword-shaped, downy. Corolla nearly regular.”—Native of the Cape; introduced into our green-houses in 1755, when it first flowered in the collection of Mr. Ord at Tullam. The broadish, downy, red-edged *leaves* are remarkable. The *flowers* are large and fragrant, rose-coloured; their segments elliptical, pointed, nearly equal. Jacquin's figure is indeed a poor one, but we can scarcely suppose, with Mr. Andrews, that it is drawn from a dried specimen, as the author says it flowered in his green-house, nor does he, like Pallas, often practise this without acknowledgment.

17. *G. flexuosus*. Thunb. Diff. 9. t. 1. f. 1. Linn. Suppl. 96.—Leaves linear, involute. Corolla ringent; segments elliptical-lanceolate; nearly equal, shorter than the tube. Stem zig-zag.—Gathered at the Cape by Thunberg, from whom we have a wild specimen. The stem is a span high, irregularly curved, and zig-zag. *Leaves* sheathing, short, linear, acute, smooth, involute. *Spathæ* large, swelling, sharply pointed. *Flowers* very pale flesh-coloured, with red ribs; tube capillary, an inch and half long; segments of the limb narrow, nearly equal in size, but ringent.

18. *G. carneus*. Jacq. Ic. Rar. t. 255. Ker in Curt. Mag. t. 591. (*G. cuspidatus*; Andr. Repos. t. 147. Redout. Liliac. t. 36.)—Leaves sword-shaped, many-ribbed. Segments of the corolla shorter than the tube; the uppermost broadest, with an involute recurved point; the three lower narrowest, dependent.—Native of the Cape. A tall and handsome plant, with several many-ribbed *leaves*. *Flowers* inodorous, two-ranked, large, flesh-coloured with a rosy hue; their three lower segments oblong, bluish, each marked with a red rhomboid central spot; the three upper broadest, especially the top one, with long recurved points, whose edges are involute. The tube is slender, longer than the limb, twice as long as the spathe. This freely blowing species is a desirable ornament for the green-house in the spring.

19. *G. cuffidatus*. Jacq. Ic. Rar. t. 257. Ker in Curt. Mag. t. 582. Redout. Liliac. t. 136. Andr. Repos. t. 219. (*G. undulatus*; Linn. Mant. 27.)—Leaves sword-shaped, many-ribbed. Segments of the corolla half the length of the tube, nearly equal, pointed, undulated, reflexed.—Native of the Cape; now become pretty frequent in gardens, for the sake of its elegance of form and colour, and its fragrance in an evening. The very long narrow segments of the *corolla*, each of which has a recurved, channelled, undulated point, and the much greater length of the tube, are striking characters. The colour is pale greenish yellow, or buff, with a remarkable lanceolate spot, stained with purple and red, on each of the three lower segments. Anthers deep blue. The Linnean name ought to have been retained for this species, but to change the present appellation would now cause more trouble than advantage.

20. *G. blaudus*. Ait. Hort. Kew. ed. 1. v. 1. 64. Ker in Curt. Mag. t. 625. 645. 648. Andr. Repos. t. 99. (*G. carneus*; De la Roche Diff. 30. t. 4. Redout. Liliac. t. 65. *G. albidus*; Jacq. Ic. Rar. t. 256. *G. campanulatus*; Andr. Repos. t. 188.)—Leaves many-ribbed. Tube of the corolla shorter than the spathe, equal to the limb, which is ringent, tall shaped; its upper segment concave; three lower narrowest, spotted.—Native of the Cape. Succeeds best with us in the open ground, but the bulbs must be taken up every year.—This is an elegant species, with

*Leaves* of the sword-shaped many-ribbed kind like the two last. The *flowers* vary in colour, from white to a pale pink, their three lower segments bearing each generally a pair of crimson spots. They vary also in size, sometimes vying in this respect with the largest. They have no scent.

We cannot but complain of those authors who burden the public with figures of trifling varieties of this and other plants, for which a single plate ought to have been sufficient; nor does the contrivance of a new name, though it may conceal the imposition, by any means atone for it.

21. *G. angustiflorus*. Linn. Sp. Pl. 53. Hort. Cliff. t. 6. Jacq. Ic. Rar. t. 252. Ker in Curt. Mag. t. 62. Andr. Repof. t. 589. Mill. Ic. t. 142. f. 2.—Leaves linear; midrib prominent on each side. Tube of the corolla longer than either spathe or limb; three upper segments ovate; three lower each marked with a triangular stalked spot.—Native of the Cape, from whence it was very early introduced into the Dutch gardens. It is readily increased, but does not flower freely, otherwise its elegance could not fail to render it a general favourite. The narrow *leaves*, compared with those species nearest akin to this, and especially the three spade-like marks of the blossom, which are constant, mark it sufficiently.

22. *G. undulatus*. Jacq. Ic. Rar. t. 251. Ker in Curt. Mag. t. 538. 647. Schneev. Ic. t. 19. Redout. Liliac. t. 121. (*G. Briatus*; Andr. Repof. t. 111.)—Leaves sword-shaped, many-ribbed. Flowers erect, funnel-shaped; segments wavy, bluntish; three lower ones much the smallest.—Native of the Cape; often cultivated in our gardens. The *leaves* are numerous, broad and upright. *Flowers* yellowish-white, or pale bluish-coloured, each segment always marked with a deep crimson central stripe which runs down into the tube. The latter is seldom longer than the spathe, often shorter.—The name of *undulatus*, which Linnaeus had applied to our *cuspidatus*, has been misapplied to this, with which however it agrees tolerably well, and we have already given our reason for retaining it. This species is the *angustus* of Thunberg, an appellation which seems corrupted from *angustus*, a totally different plant in every possible respect, nor are his quotations of Breynius, and of Linn. Mant. less erroneous. There is no end of correcting indifferent names, but *undulatus* ought, as Mr. Ker now allows, to have remained with the Linnæan plant; if so, *vittatus*, in allusion to the somewhat similar *Anaryllis vittata*, might have served for the species before us, though indeed it also suits the following.

23. *G. floribundus*. Jacq. Ic. Rar. t. 254. Ker in Curt. Mag. t. 610. (*G. grandiflorus*; Andr. Repof. t. 118.)—Leaves sword-shaped, many-ribbed. Flowers erect, funnel-shaped; segments nearly equal, flattish, emarginate, the uppermost broadest.—Native of the Cape; introduced into England by Lee and Kennedy in 1788. *Bulb* large. *Leaves* broad, with a thick edge, and often salient. *Flowers* numerous, generally larger than in most other species, very pale pink, blue, or white, with a dark central stripe to each segment. The summits of the segments are emarginate, with a little point, and they are scarcely at all undulated.

24. *G. Milleri*. Ker in Curt. Mag. t. 632. Ant. Hort. Kew. ed. 2. v. 1. 101. (*Antholyza*, &c; Mill. Ic. t. 40.)—Leaves with many prominent ribs. Flowers inclining one way, bell-shaped, nearly regular; upper segment rather narrower than the next; tube fleshy, slender.—Native of the Cape, but rare in gardens. Miller raised it from seed in 1757, and figured it as an *Antholyza*. It is of the same tube as the two last, but differs in having a more inclined

and more equal *corolla*, at first white then yellowish, with a darker purplish central stripe on the three lower than on the three upper segments. The tube, according to Mr. Ker's remark, though externally slender and exactly cylindrical, is peculiarly fleshy, resembling a flower-stalk. The outer *spatha* is inflated and convolute, oftener longer than the tube.

25. *G. cardinalis*. Curt. Mag. t. 135. Schneev. Ic. t. 27. Redout. Liliac. t. 112.—Leaves many-ribbed. Stem branched. Flowers erect, in one row, funnel-shaped; segments elliptical; three lowermost smallest, each with a lanceolate white spot.—Native of the Cape, from whence it was brought to Holland, and from the latter country to England by Mr. Grazier; before 1789, unless we are greatly mistaken. It will bear an open border in a warm situation, but the bulbs must be taken up yearly to make it flower in its natural magnificence. The rich scarlet of its *bloffons*; and their three white spots, distinguish this fine species. Its green has a glaucous cast, and the *stem* is properly branched, two or three feet high.

The name alludes to the scarlet colour, like that worn by the cardinals at Rome, as used by Linnaeus in *Lobelia* and *Lobelia*. The pious Scopoli thought the application profane, and changed it in the latter instance to *rubra*. See his *Annus primus*, 159.

26. *G. byzantinus*. Mill. Diët. ed. 8. n. 3. Ic. t. 142. f. 1. Ker in Curt. Mag. t. 874. Dryandr. in Ant. Hort. Kew. ed. 2. v. 1. 102. Park. Parad. 191. f. 3.—Leaves many-ribbed. Spike two-ranked. Flowers horizontal; upper segment covered laterally by the next; three lowermost equal, each with a linear-lanceolate stripe.—Supposed to be a native of Turkey, it having been for near two centuries a hardy inhabitant of our gardens, under the name of the Byzantine corn-flag, though generally confounded, as *G. communis* of Linnaeus, with the two following. We readily submit to Mr. Ker's corrections of this error, in which we have, in common with most botanists, been involved, but which is now also corrected in the new edition of *Hort. Kew.*—All the three have broad, upright, acute, many-ribbed *leaves*, and handsome crimson *flowers*, projecting horizontally, in a long upright, unbranched spike, with lanceolate concave bractæus. The three segments of the lower lip are each marked with a central white or yellowish stripe, bordered with deep red, and more or less dilated in the middle. The *flowers* of the present species are larger than in either of the other two, their three lower segments very nearly equal in size and shape; the uppermost is embraced and covered at its sides by the lapping over of the two lateral segments, so that the flower is closed, not pervious, at that part. It blossoms in June, rather before the *communis*, but, according to Mr. Ker, never bears seeds in England, nor does it increase by root so rapidly as the other two.

27. *G. communis*. Linn. Sp. Pl. 52. Curt. Mag. t. 86. Riv. Monop. Irr. t. 110. (*G. maritimensis*; Ger. em. 104. Park. Parad. 191. f. 1.)—Leaves many-ribbed. Spike one-ranked. Flowers horizontal; upper segment covered laterally by the next; three lowermost each with a linear-lanceolate stripe; the central segment very large.—Native of fields in the south of Europe, especially in moist situations, where it is a troublesome weed. It is now less commonly kept in our gardens than the last, from which it differs in the smaller size of its *bloffons*, which are approximated nearly into one row, only a little spreading alternately, and whose lowermost or central lobe is as broad as both the other two, and considerably longer. This is visible even in dried specimens.



Specimens. We have this species from M. Favrod's herbarium, gathered wild in Switzerland, so that it appears to be Haller's n. 1261, the smaller variety; his larger being probably the following species. There is much difficulty in determining the synonyms of old authors, their cuts not being correct in those parts on which our characters are founded; Parkinson's *G. italicus*, for instance, Parad. 191. f. 2, has precisely the lower lip of this present species, but not the inflorescence, whilst his f. 1. does not shew the lip so well as the position of the flowers. As however he mentions but two white stripes in his description, so many only being visible, as the segments naturally stand in our *communis*, we have little doubt of his synonym. The *communis* of the Linnæan herbarium is our's, and has winged seeds, so that we trust this name will remain fixed, as belonging to the most common and general species, whatever Linnæus might comprehend under it as varieties.

28. *G. fegetum*. Ker in Curt. Mag. t. 719. Dryand. in Ait. Hort. Kew. ed. 2. v. 1. 102. (*G. communis*; Bulliard. Herb. de la France, t. 8. Sm. Fl. Græc. Sibth. v. 1. 27. t. 37, 38. Lamarck Illustr. t. 32. Tourn. t. 190. *G. italicus*; Ger. em. 104.)—Leaves many-ribbed. Spike one-ranked. Flowers horizontal; upper segment distant; three lowermost equal, each with a linear-lanceolate bordered stripe.—Native of corn-fields in the south of Europe, common in Italy, Greece, and the neighbouring countries, flowering in the spring; hardy, but not frequent in gardens. It is distinctly represented in the Hortus Eystettensis, by the name of *Viciorialis rotunda*; Ord. Eit. 4. t. 10. f. 2, though the other *Gladioli* of that huge book are less precise. This is distinguishable from the two last by the distance between the uppermost lobe of its *bluffs* and the two next, which are peculiarly narrow; and while the *seeds*, according to Mr. Ker, are round, with a somewhat pulpy coat, not flattened and winged as in the whole of the genus besides, which is a most material specific distinction, and even forms an exception to one of the generic characters. Mr. Ker suspects the existence of other European species, still confounded as varieties of these, and which may perhaps account for anomalies and incongruities in the figures of authors. Whether t. 38. of Flora Græca may be one of these, we must submit to future enquiry. Though small, it is said to be a native of fertile ground; the three upper segments seem more approximated, and the three lower ones united by a longer base, than in t. 37, our *G. fegetum*; but this we learn merely from the figure, nor was the artist acquainted with the characters subsequently found out in this tribe, so as to give peculiar authority to what he has expressed in his drawing. The acquisition of living specimens at some future time can alone settle the question.—It is proper to mention that *G. spicatus* of the Linnæan herbarium, alluded to by Mr. Ker, is a Siberian specimen, with very broad lateral segments to the corolla, and as far as we can judge seems rather to be *communis*, if not, as is possible, a species hitherto undefined. It is probably different from the African plant of Van Royen, intended in Sp. Pl. ed. 1. nor has it the authentic marks of originality. What might chance to be compared with it in the Banksian herbarium, when none of the parties present had any precise ideas about these plants, we cannot answer for, but our specimen was then voted to be *communis*.

29. *G. imbricatus*. Linn. Sp. Pl. 52. Lamarck. Dict. v. 2. 723.—Leaves many-ribbed, spike of numerous, crowded, upright flowers; upper segment rather distant; three lowermost nearly equal.—Gathered by Gerber near Luban in Livonia. His own specimen in the Linnæan herbarium is the only one we have seen, nor do recent writers appear to know any thing

of this species, which appears to us very distinct, akin to the three last in leaves and habit; but differing widely in its curved ascending spike, and crowded erect flowers, which are smaller than those of *G. communis*, of a purple or crimson colour, pervious at the base, in consequence of a considerable distance between the claws of the upper and lateral segments, while their upper parts seem to fold over each other; but of these characters we cannot, of course, speak absolutely, from the dried flowers; the three lowermost segments seem equal and rather narrow. No white stripe is discernible in their present condition. The leaves rise above the spike of flowers, and have each an oblique point, but this may not be constant.

Whatever species of *Gladiolus* (exclusive of such as are now referable to the genera *Sparaxis*, *Anomatheca*, *Tritonia*, *Watsonia*, *Melastropharula* or *Balsana* of Mr. Ker), may be found here and there in authors, we decline describing without seeing living specimens. The discordance between several of the figures, above quoted for the same species, proves how variable many of them are, especially from accidental circumstances in cultivation. The Botanical Magazine is now become a faithful and valuable repository of this family, so that however botanists may differ about definitions, the memory of the plants can never be entirely lost.

GLADIOLUS, in Gardening, comprises plants of the tuberous-rooted, showery, perennial kind; of which the species mostly cultivated are the common sword-lily, or corn-flag (*G. communis*); the imbricated flowered gladiole (*G. imbricatus*); the square-stalked gladiole (*G. trititis*); the narrow leaved gladiole (*G. angustus*); and the superb scarlet gladiole (*G. cardinalis*).

There are several varieties of the first species, as the Italian and French corn flags, with the bluish, the white, and the small purple coloured.

*Method of Culture*.—In the first sort and varieties the culture may be readily effected by planting the off-sets from the old roots in the beginning of the autumn in the places where they are to grow. And the other sorts may be raised in the same way as well as by seeds. These should be planted in a warm border, and be protected in the winter by glass or some other means, when there is a necessity for it, as during very severe weather, &c.

When increased by seed it should be sown towards the end of August, in pots filled with light earth, placing them in a shady situation at first, but afterwards where they may be exposed to the sun, being protected during the winter in a hot-bed frame, free air being admitted when the weather is mild. In the spring the pots should be removed to a shady situation, with only the morning sun. When the stems decay, the roots should be taken up and kept in sand in a dry place till the time of planting. In the second year's planting they should be put in separate small pots, filled with mould formed from the turf or sward.

With respect to the old roots they may be taken up every two or three years, to have the off-sets taken off from them, in order to their future increase.

All the sorts afford a fine effect and variety in the flower borders and other parts among other plants of the showery kinds, being properly arranged in mixture with them.

GLADIUS, SWORD. *Jus Gladii*, or right of the sword, is used, in our ancient Latin authors, and in the Norman laws, for supreme jurisdiction.

Camden, in Britannia, writes "Comitatus Flint pertinent ad gladium Cestrie;" and Selden, Tit. of Honour, p. 640. "Curiam suam liberam de omnibus placitis, &c. exceptis ad gladium ejus pertinentibus."

And it is probably from hence, that at the creation of an

earl, he is *gladio succinus*; to signify, that he had a jurisdiction over the county.

**GLADIUS piscis**, in *Ichthyology*, a name used by many for the sword-fish, called also the *xiphius*, which see.

**GLADKA**, in *Geography*, a fort of Russia, in the government of Caucasus, on the Malva; 36 miles W. of Kiliar.

**GLADWIN**. See **IRIS**.

**GLADWIN, JOHN**, in *Biography*, the late organist of South Audley chapel, was the first performer on the organ at Vauxhall, after the building of the orchestra in the middle of the gardens, and the establishment of a regular band. He was a pleasing player in his day, and a worthy man, who lived to a great age, and died in 1799.

**GLAIR of Eggs**, is the same as the white of eggs, and is used as a varnish for preserving paintings. For this purpose it is beat to an unctuous consistence, and commonly mixed with a little brandy or spirit of wine, to make it work more freely, and with a lump of sugar to give it body and prevent its cracking; and then spread over the picture or painting with a brush.

**GLAIZE, AU**, in *Geography*, a S. S. W. branch of the Miami of the lake in America, which interlocks with St. Mary's river. By the treaty of Greenville, the Indians have ceded to the United States a tract of land, six miles square, at the head of its navigable waters, and six miles square at its confluence with the Miami, where port Desiance now stands.

**GLAMA**, in *Zoology*. See **CAMELUS**.

**GLAMMISS**, in *Geography*, a small town in the county of Forfar, Scotland, contains 385 houses, and 1931 inhabitants. Here are two small manufactories of yarn, and coarse linen cloth. The earls of Strathmore formerly possessed, and occupied a noble castle in this parish. The remains of this baronial fortress are still very considerable, and occupy a commanding site on the banks of the river Dean. In this parish are several ancient obelisks, or stone crosses; also many cairns. These are traditionally said to commemorate the murdered King Malcolm II. Glammiss is divided into two parts respectively, called the New, and the Old Town.

**GLAMORGANSHIRE**, the south maritime county of South Wales, is supposed to have derived its name from having afforded a temporary, though insecure, retreat to an ancient prince, at a very early period of British history. The story is briefly recapitulated by Spenser, in his *Chronicle of British kings* (Faery Queen, b. ii. c. 10.) Glamorgan was in succeeding ages an independent sovereign principality, distinct, as those who profess to be acquainted with the ancient history of Wales assert, from the rule and government of South Wales. The principality, or sovereign lordship of Glamorgan, as these persons say, contained the present counties of Glamorgan and Monmouth, the southern and eastern parts of Brecknockshire, and that part of Herefordshire lying to the west of the river Wye.

The lordship of Glamorgan was subdivided, at an early period, into a great many petty lordships, in every one of which their lords exercised "*jura regalia*," reserving, however, to the subject a right of appeal to the court of the chief lord, or, as he was termed, the lord paramount. There are at least 50 ancient buildings still remaining in the district, universally understood to be the halls in which the courts of legislation and of justice were held for the respective petty lordships. They are now commonly called "Church-houses," and belong to the parishes in which they stand. They are at present used as school-rooms, and occasionally for dancing; an amusement still common in Glamorganshire, though now beginning to decline. The ground-

floor apartments under these halls are used as alms-houses for the poor of the parish. From ancient surveys and other accounts of the lordships it appears that before the reformation a market was held in each of these halls every Sunday morning, till the tolling of the first bell, which is said to have been intended as a notice for the business of the market to cease. The second bell was a signal of preparation for church, and the third for the commencement of divine service, during which no door, but the church door, was allowed to be seen open.

This county, extending about forty-eight miles from east to west, and 27 from north to south, is bounded on the N. by Brecknockshire, on the E. by Monmouthshire, from which it is separated by the river Remny, on the S. by the Bristol channel, and on the W. by Caermarthenshire. The greatest part of the sea-coast forms a semi-circular course; the western extremity being formed into a narrow beak between the open channel on the one hand, and an arm running round to the Caermarthenshire coast on the other. (See **GOWER**.) An ample account of the manner in which the lordship of Glamorgan was obtained by its conquerors, is to be found in Powell's History of Wales, written in the time of Elizabeth, or in Evans's edition of Wynne's History of Wales. The following abstract is taken from Malkin's work. Jestin ap Gurgant, a petty prince of odious character, waged war, in the year 1088, against Rees ap Tudor, and was assisted by Eneon ap Collwyn. Unable to make any impression on his enemy's dominions, Jestin commissioned Eneon to go to England, and to procure some more powerful ally. His propositions were eagerly received by Robert Fitzhagen, and twelve other Norman adventurers, who came to Glamorgan on an expedition, professedly for the purpose of retrieving the affairs of Jestin. The allies, marching against Rees ap Tudor, came up with his forces on the borders of Brecknockshire. In a battle which ensued at a place called Hirwin, Rees was entirely defeated: and in his flight was taken prisoner, and put to death. On this occasion, Jestin betrayed his characteristic treachery, by violating his agreement with Eneon, to whom he had promised his daughter in marriage, as a recompence for his services. Eneon, justly offended, was determined on revenge; and therefore, when the Normans, after having fulfilled their engagements, and having obtained satisfaction for their services, quietly returned home, Eneon represented the injuries he had sustained by the treachery of Jestin, and also the hatred of the country to its tyrant. He also stated how easy it was to obtain possession of this feeble country, with the aid of the different princes at variance with Jestin. R. Fitzhagen, and his soldiers of fortune, availing themselves of the favourable moment, turned their arms against their employer, who was unprepared for so formidable a reverse, and overran the country; whilst Jestin saved himself by flight, and died soon after, unlamented and unrevenged. Fitzhagen, upon a division of the conquered territory, took for his own share the castles of Cardiff and Kenfig, with the market town of Cowbridge, and the demesne of Llantwit; appropriating to himself the lands belonging to them, together with the sovereignty of the whole country. The other parts were distributed in various proportions among his followers. Eneon ap Collwyn, in particular, possessed Caerphilly, with Jestin's daughter in marriage, the prize which occasioned the contest. (See **WALES**.) With respect to the picturesque character of this county, it is distinguished by unbounded variety. It has sea, mountains, valleys and rivers; and it is said to resemble North Wales in general aspect more than any of the six counties. Its mountains are not so high as those of Brecknockshire, but they present, in a considerable degree, the appearance

## GLAMORGANSHIRE.

appearance of Merionethshire, by their extreme abruptness, which imparts an air of wildness to the country, and of elevation exceeding the reality to them. They differ, however, in one material respect, that they exhibit greater traces of cultivation and occupancy. Glamorganshire lies under the imputation of want of wood; but this is only true of its level and most cultivated parts. The observation does not apply either to its eastern or western extremities. Those who know the banks of the Taff, the two Ronthas, and the Cunno, the wilds of Abudarr, and Yltradrywodwg, have seen such woods and groves as are rarely to be found. The magnificently clothed hills of Margam, Bagland, Britonferry, and the vale of Neath, unite the beauties of cultivation with the unfelled luxuriance of forest scenery. Glamorganshire produces with sufficient liberality oak, ash, beech, and all the common forest-trees, except elm, which is observed not to be indigenous. On the north and north-east sides this county is very mountainous; and in some parts presents rugged rocks, and in others a soil covered with plenty of fine wood, and concealing rich mines of coal and iron. A tract of land can scarcely any where be found more inviting to scientific cultivation than the vale of Glamorgan, between the mountains and the sea; and yet it is observed that the agriculture of this county does not keep pace with the fertility of the soil. In addition to natural fruitfulness, they have lime every where at command for manure; and this facility affords a strong temptation to that act of injustice which the farmers call "driving the land." In Glamorganshire, good land, situated near a considerable town, lets almost as high as within five miles of London; but land among the northern hills, scarcely reclaimed, and from its locality irreclaimable to any very lucrative purpose, is of course low in its rent, and occupied only by tenants, natives of the hills, and unacquainted with the superior advantages and comforts enjoyed by the farmer in the vale. Another circumstance which materially affects the value of farms, is light of mountain; where that is attached to an estate, it compensates in some degree for distance from markets or poverty of soil. These considerations are applicable to other counties as well as Glamorganshire. But what distinguishes and enriches this county above all the rest is the profusion of coal, iron, and lime-stone, with which it almost every where abounds. The earth, indeed, of which it is composed, taken externally and internally, seems to be full of every thing necessary to the use and convenience of man. Manure, metal, and the means of manufacturing that metal, are all found on the same spot; so that industry is exerted at the least possible expence, and consequently to the greatest possible advantage. The rivers, and mountain torrents, so remarkable in this district, afford an ample supply of water for all the purposes of life, as well as the means of procuring that artificial and cheap conveyance which is among the most ingenious improvements of the present age. With respect to that most extensive bed of lime-stone, of which nearly the whole of Glamorganshire forms only a part, it commences with the eastern extremity of the county, and, taking a direction due west, runs in a straight line to Swansea bay, appearing again in Gower, and, having passed under Caermarthen bay, is seen to occupy in great part the south and west of Pembrokeshire; it then takes its course through St. George's channel, and is found in Ireland in that exact bearing which unquestionably marks its continuity.

The air on the N. side of the county is sharp, occasioned by the long continuance of the snow on the hills; but on the S. side mild and temperate, occasioned by the sea-breezes. That in the vicinity of Margam is deemed peculiarly salubrious.

The antiquity of the cottages is a strongly marked feature in the appearance of this county. Many of them are probably as ancient as the castles, to which they were attached. Their architecture is particularly deserving of notice. The pointed door-ways, and pointed windows, sufficiently evince their date; and though Welch towns are universally censured by strangers, for the inelegance and inconvenience of their houses, the direct reverse is the fact with respect to the habitations of the peasantry. There is one circumstance, besides their general structure, that of many of which is the ancient Gothic, which adds to the respectable appearance of the cottages, and that is, the universal practice of lime-whitening them. This has been the custom of the county from very remote ages, and is extended even to the barns and stables, to the walls of yards and gardens. It is noticed and praised in the most ancient Welch poems, and certainly evinces a very early sensibility to the arts and decencies of life. The price of provisions in this county has of late very much increased, and is comparatively very high, on account of the increased demands of the manufacturing districts, which are numerous. The price of labour is equally enhanced from the same cause. The increase of population, owing to the influx of commerce, and the magnitude of its establishments at Swansea, Merthyr-Tydvil, Neath, Aberavon, Melin Gruffydd, near Cardiff, where are the largest tin works in the kingdom, &c. afford another reason why the cheap comforts and elegancies of life are no longer to be fought for here.

The dress in Glamorganshire is not so strongly marked as in some other counties, except that the women universally adopt the man's hat; but they wear it with a very good grace, and are remarkably neat in their attire, as well as comely in their persons, and graceful in their carriage; which may probably be attributed to the habit of dancing, which is their favourite amusement. Their modes of greeting are unusually affectionate, sometimes bordering on the ludicrous, particularly among the women, who are constantly seen saluting each other at market, and on the most ordinary occasions of business, as well as on occasions of distress. At a wedding it is the custom of all who are invited, both men and women, to ride full speed to the church porch, and the person who arrives there first has some privilege or distinction at the marriage feast. In case of death, the bed on which the corpse lies is always strewed with flowers, and the same custom is observed after it is laid in the coffin. It is an invariable practice, both by day and night, to watch a corpse; and the hospitality of the country is no less remarkable on melancholy than on joyful occasions; for the invitations to a funeral are very general and extensive; and the refreshments are not light, and taken standing, but substantial and prolonged. The grave of the deceased is constantly overspread with plucked flowers for a week or two after the funeral; the planting of graves with flowers is confined to the villagers, and the poorer people. It is very common to dress the graves on Whitfriday, and other festivals, when flowers can be procured.

The Roman stations, forts, and camps, in this county, are generally understood to be at Cardiff, Cwrphilly, and Caera, which lies between Wenvoe, a large handsome house built in the castellated form, and the Cardiff road. The great Roman road was over Newton Down, leaving the present road on the right, and passes through Kenfig to Margam, and as straight as the nature of the country will admit, through Aberavon parish to Neath. Glamorganshire contains one episcopal town, viz. Llandaff, and several others, as Cardiff, the capital of the county, Cwrphilly, Llantrisant, Cowbridge, Bridgend, Neath, Merthyr-Tydvil,

and Swansea; which see respectively. The principal rivers are the Remney, the Taff, the Elwy, the Ronthas, great and small, the Ogmere, the Cunno, the Nedd or Neath, the Tawe or Tave, and the Lloghor. In this county are several rail-ways and canals. (See CANAL.) The canal from Merthyr-Tydvil to Cardiff was completed in the year 1798. From the tide-lock, where it enters Pennarth harbour, up to the town of Cardiff, it is navigable for ships of 400 tons; but from Cardiff to Merthyr-Tydvil, it is navigable for barges of 100 tons. The head of this canal at Merthyr-Tydvil is 568 feet five inches higher than the tide-lock two miles below Cardiff, where it falls into Pennarth harbour. This canal has upwards of 40 locks upon it in the space of 26 miles, which is its whole length; and it is crossed by more than 40 bridges. For an account of the bridge with one arch upon Taff; see BRIDGE. In a vale S. W. of Cardiff, near Duffrin house, and not far from the village of St. Nicholas, are some ancient monuments, supposed to be druidical. The most remarkable of these monuments is a grey stone, which classifies among those pieces of antiquity called Cromlechau. (See CROMLECH.) This monument is supported by five large stones, enclosed entirely on the east, west, and north sides, and open to the south, forming a considerably large, though low room, 16 feet in length, 15 wide, and, at the east end, six feet high, but only  $4\frac{1}{2}$  at the west end. The rubbish about it prevents the investigation of its original height. The supporting stone to the north is 16 feet long; that on the west end about nine feet in length. At the eastern extremity three stones are set closely together; the middle stone is  $4\frac{1}{2}$  feet wide, the northern stone of these three about three feet, and the southern nearly two feet in width. These stones, standing upright, support a large stone on the top, which forms the roof of this rude apartment. The length of this horizontal stone is 24 feet; it is 17 feet in its widest part, and of different breadths at other places; it is 10 feet at one extremity, and 12 about the middle; and from two feet to two and a half thick. The area of the top-stone, therefore, having for its mean breadth  $13\frac{1}{2}$  feet, and 24 feet for its length, will contain 324 square feet; whence it appears that it is nearly thrice as large as that of the famous cromlech, near Newport in Pembrokeshire. Near this cromlech are other heaps of stones called Carneu or Cairn. Of these cromlechs different opinions have been entertained. Some have supposed them to be places of shelter for the Druids, who always worshipped in the open air, and after them, for the first Christian priests, in rain and other inclemencies of the weather; others have supposed them to be oratories, from the tops of which they delivered their discourses; and others again, that they were altars on which victims were offered in the times of Druidism.

Glamorganshire is divided into ten hundreds, and 118 parishes, which, in 1801, contained 71,525 inhabitants, of whom 6903 were employed in trade and manufacture, and 18,515 in agriculture. Two members are returned for Glamorganshire to the British parliament, viz. one for the county, and one for the boroughs, Cardiff, &c. Malkin's South Wales.

GLAMOUR, or GLAMER, an old term of popular superstition in Scotland, denoting a kind of magical mist believed to be raised by forcerers, and which deluded their spectators with visions of things that had no existence, altered the appearance of things really existing, &c.

GLAN, a river of France, which runs into the Nahe, three miles E. of Sobernheim — AÛc, a river of Carinthia, which rises near Kofenberg, and joins the Gurck, four miles E. of Clagenfurt.

GLAND, in *Anatomy*, is a name applied to those organs of the body, which separate from the blood conveyed to them by their blood-vessels various substances, generally of a fluid nature, and discharge them through one or more tubes, called excretory ducts. The term however has been, and is employed more extensively, having been applied to various organs, which, although analogous in their structure, on superficial observation, to those already designated, do not resemble them at all in their functions. Thus, the small bodies belonging to the lymphatic system have been called lymphatic or conglobate glands; although the knowledge hitherto acquired by physiologists concerning the action of these bodies, and their anatomical relations and connections do not warrant us in ascribing to them any function similar to those exercised by the glands properly so called: the account of these will be found under the articles ABSORBENTS and ABSORPTION. The pineal, thyroid and thymus glands, the renal capsules and the spleen, have all been included in the glandular system of the body, but will not be considered in this article, as we know nothing at all of their offices, and have no reason to suppose that they secrete any fluid. Our definition will include the salivary, lacrymal, and Meibomian glands, the tonsils, the ceruminous glands of the ear, and the sebaceous glands of the face, in the head; the mammary glands in the chest; the liver, pancreas, and kidneys in the abdomen; the prostate, testicle, Cowper's glands, and glandulæ odoriferæ about the penis; and the extensive system of mucous glands about the head and trunk. These parts, although differing widely from each other in many respects, agree in a sufficient number of points to allow of their being arranged in one organic system, which has been named the glandular: the other organs just enumerated, belonging to this only in name, are excluded from the arrangement by their texture and properties, their mode of vitality and functions. The extremities contain no parts belonging to the glandular system; the fluids formed in the different organs of this apparatus belong almost entirely to the organic functions, while the limbs are particularly designed to execute the offices of the animal life.

As the physiology of these organs cannot be conveniently separated from the history of their structure, we shall consider the vital properties as well as the organization of the glandular system; and we should make a very unnatural and arbitrary division of the matter, if we did not give at the same time a view of secretion in general. We shall present the reader, in the first place, with an enumeration and arrangement of the secreted matters; we shall proceed, secondly, to give a general view of the organization of the glandular system; and shall exhibit, in the third and last place, the opinions of physiologists concerning the mode of action of the glands and the subject of secretion in general. The reader will observe that the present article is of a general nature; the structure of the particular organs will be described on other occasions, and detailed accounts of the nature and properties of the various fluids will be found under their respective titles, or in other articles of the work.

The blood, apparently an homogeneous fluid, is composed of various matters, which chemical examination can detect and separate. It contains gelatine, albumen, fibrine, acids, alkalies, earths, saline and colouring matters, which are employed for the renovation of the solids and fluids of the body. It presents these to the various organs, which, by converting them into their own substance, derive the means of supplying the waste occasioned by the natural actions of the parts, or form out of them various products, distinguished by new characters, and extraneous to their own composition.

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tion. The former of these processes is nutrition or assimilation; the latter secretion: they resemble each other in their commencement, in which the organ, by some powers of a nature entirely unknown to us, but peculiar to living bodies, and forming part of that complicated notion, which we express by the term vitality, selects from the blood such principles as suit its nature or functions; but they differ in the employment of what is thus selected, which is retained in the body, and assimilated to the already existing organization in the former case, and applied to some other purpose in the latter. The subject of nutrition does not come under our notice at present.

The products of secretion result from an essential change in the compound conveyed to the organ, from a new combination of the principles contained in the blood, which is transformed by the specific action of the various organs into different fluids, retained in or expelled from the body, according to the qualities of each. Hence, there are organs which, after forming certain fluids, collect and retain them; while others separate and expel their secretions from the body. The object of the secretions is, to collect those which are destined to fulfil important uses in the body; while that of the excretions is, on the contrary, to expel matters which would be injurious to the frame. The two functions then of secretion and excretion resemble each other in most respects: there is in both a separation and collection of fluids. The difference consists in this, that in the former case the separated fluid remains in the body, while it is soon expelled in the second. Thus secretion always precedes excretion; and, in order to understand the latter, it is necessary to know how the former takes place.

The word secretion, derived from *secerno*, I separate, signifies simply the act of separating; and its physiological import is conveyed in that notion. It denotes, in physiology, that function of a living body, in which various fluids, differing from the blood and from each other, are prepared from the common mass of the blood, the same fluid being constantly formed in the same organ. No part of physiology is more obscure, and more difficult in its investigation, than this very function. Malpighi, who had bestowed great labour on the structure of the glands, and was considered to have unveiled, in a great measure, the mysteries of their organization, confesses his ignorance on this subject; and, as the avowal, from such a quarter, is interesting, we subjoin the passage, observing that the remarks here made, concerning the kidneys, apply equally to all other secretions. He says of the urinary secretion, "*quam arte id contingat obscurissimum: licet enim glandularum ministerio totum hoc subsequi rationi sit consonum, quoniam tamen minima illa, simplexque meatuum in glandulis structura nos latet, ideo quedam tantum meditari possumus, ut hunc quaesito probabiliter satisfaciamus. Necessesse est hanc machinam interna configuratione separationis opus peragere; an vero his, quae ad humanos usus passim usurpamus, quibus fere consimilia effingimus, consonet, dubium; licet enim occurrant analogae spongiae, incerniculi, fistularum cribrorumque structurae, cui tamen ex his consimilibus undequaque sit renam fabrica, difficillimum est assignare, et cum naturae operandi industria secundissima sit, ejusdem ignotae nobis reperientur machinae, et quas nec mente quidem assequi licet. Illud miror tam copiosa, diversaque corpora separari per has glandulas in naturae statu, exit enim substantia aqua cum salinis, sulphureis et consimilibus particulis, et ex morbo etiam abscessuum: reliquiae, et totius quaedam corporis inquinamenta separantur de dentis sanguineis particulis," &c. *De Viscerum Structura; De Renibus*, cap. 6. The whole business is carried on in the*

minute, and, as we may call them, elementary parts of the viscera and glands, the structure of which eludes the research of our senses, and can still less be developed by reasoning or reflection. Observation cannot follow the work throughout; nor does it admit of elucidation by experiment, like some other subjects which have been explained by artificial imitation of the proceedings of nature.

Unwilling to confess their ignorance and leave their systems imperfect, physiologists have attempted to raise, on hypotheses, that structure, for which anatomy afforded no foundation. Their notions, resting merely on probabilities and loose analogies, have flourished and fallen in succession; and we shall find that the list of truths and ascertained facts is much shorter than that of opinions and errors.

The composition of the secreted fluids presents various differences in the nature and proportions of their constituent parts. They possess, in common, all the general characters which belong to animal substances; but each has certain particular distinctive qualities, depending on the various simple or compound principles, the union of which determines its specific nature. Thus, setting aside the resemblance of all our fluids, considered as animal productions, fat does not resemble bile; the latter is very different from milk; which, again, has no resemblance to the salivary, gastric, pancreatic, feminal fluids, &c. which must be referred to so many different classes.

The arrangement of the animal fluids is more difficult than we should have expected at first sight. The false and imperfect notions, which were long entertained of their chemical composition, lead to classifications founded on the uses to which they seemed to be destined. Those employed in the nourishment and growth of the body were called recrementitious, such as chyle, blood, serum, lymph, &c. The excrementitious included those which are expelled from the body; as the urine, perspiration, &c. A third class was made up of such as partake of the characters of both these; of which a part is rejected as noxious, while the rest is retained, in order to answer some particular purpose. Under the head of excremento-recrementitious humours, were arranged the saliva, bile, pancreatic juice, mucus of the intestines, &c. The objections to such an arrangement are too obvious to need enumeration. This division, as well as that before alluded to, of excretions and secretions, cannot be adopted with any benefit, while the nature and objects of many secretions are so little understood, that we cannot determine whether they are expelled as noxious, or serve very useful purposes in the economy. The bile, for example, has been very commonly deemed an excrementitious fluid, but by a completely arbitrary assumption: what proof have we that perspiration separates any thing noxious from the blood? For what reason is the secretion of the pancreas placed in one rather than in the other of these divisions?

Pitcairne, who was followed by Michelotti, divided the animal secretions in a manner which has, at least, the merit of simplicity, and leads to no false notions concerning their uses; he distinguished them merely as being thick or thin.

Haller distributed the fluids into four classes, according to the chemical notions of his time, and to the degree of complication in their elements. 1. The aqueous fluid. These have a very large proportion of water in their composition; hence they are distinguished by their fluidity, and have no ropiness. Fire dissipates them almost entirely, excepting a very small proportion of earthy residue; neither alcohol nor acids coagulate them. Besides a little earth,

they



they contain some saline and oily matters. Many of our fluids belong to this division. Some are expelled from the body, and are ordinarily deemed excrementitious; such are the urine, which is not coagulable in the natural state; the insensible Sanctorian perspiration, and the pulmonary exhalation. Sweat is a mixed fluid, containing oily or sebaceous matter, together with water. Several of the fluids, which are destined to serve particular purposes in the animal economy, contain very little except water. This is the case with the secretion of the proper salivary glands, with that of the pancreas and lacrymal gland; with the perfectly pure and transparent aqueous humour of the eye, and other watery fluids in the same organ.

2. Mucous fluids. These differ from water in being less fluid; they are tenacious, so as to adhere to solid bodies, andropy. They mix with water, are inlipid and inodorous, and nearly colourless. The evaporation of their aqueous parts reduces them into hard and dry crulls. Acids do not coagulate them; but alcohol has a slight effect. They yield, on distillation, a large quantity of water, volatile salt, oil, and a carbonaceous residue. To this division belong the lubricating fluids, which are poured out over the extensive surfaces of the respiratory, digestive, urinary, and genital organs, and all the parts connected with them.

3. Gelatinous fluids; which are coagulable by heat, warm water, alcohol, and acids, remain fluid below 148° Fahrenheit; and have a mild or slightly saline taste. Haller places in this order the serum of the blood, the lymph conveyed by the absorbents, the water of the amnios, the ferous exhalations of the circumscribed cavities, the lymph of the cellular substance, and the fluid of the Graafian ovula. He also places in this division the synovia of the joints, and the fluid of the tendinous thecæ; observing, at the same time, that these are partly composed of oily matters.

4. Oily fluids. These are represented by Haller as more perfectly animalized productions: they are freed from the superfluous quantity of water, and are inflammable; or at least contain much of that matter which takes fire and deflagrates. At their first production they contain much water, so as not to be capable of inflammation, nor to possess their peculiar characters, but rather to resemble mucus or gelatine: they undergo changes afterwards, which deprive them of their aqueous parts, and render them more viscid and oily. The fat and the medullary substance of the bones, are the most extensive specimens of this order: it contains also sebaceous matters of various kinds, as the greasy cutaneous matter, the Meibomian secretion of the eye-lids, that of the glans penis, and of the external organs in the female. The bile, cruor of the blood, milk, and prostatic fluid, belong to the same class.

Such are the four divisions, in which Haller has arranged the animal fluids: he observes that several, being of a mixed nature, do not belong exclusively to either class, but ought, from the diversity of their principles, to be referred to more than one: indeed there is hardly any, which can be rigorously said to consist of a single element. Then, again, many evidently contain more fluids than one, formed separately in the first instance, each in its appropriate organ, and afterwards mixed together. Thus the semen contains the secretions of the testis, prostate, and vesiculae; the sweat is made up of the water of perspiration with the cutaneous oil; the tears are a mixture of water, mucus, and sebaceous matter; spitte contains water and mucus, &c.

The vast improvements in the science of chemistry since the time of Haller must necessarily have subverted the basis of the arrangement just described; which, when considered

by a chemist of the present day, would be found open to objection at all points. The deficiencies of the classification are too obvious to render it necessary that we should particularize them.

Blumenbach has classed the products of secretion on a somewhat different principle. "The secreted fluids," says he, "display on one hand so much variety, while on the other they seem to be joined by so many points of affinity, that their arrangement in classes must be in great measure arbitrary. They may, however, be disposed in the following order, according to the slighter or more essential changes and modifications which their elements, contained in the mass of the blood, undergo in the secretory organs. Milk may be placed in the first rank, as consisting apparently of a very simple modification of chyle, and formed from the blood by a very easy process after the influx of the chyle. The watery secretions come next, so called from their fluidity and transparency, although they differ materially from water in the nature of their constituent elements, particularly in containing a portion of albuminous coagulable matter—including the fluids of the eye; the tears, the matter of perspiration, the exhalations in the cellular substance, and in the thoracic and abdominal cavities, to which the liquor pericardii and the fluid of the ventricles seem to be analogous. The urine, ordinarily referred to the aqueous fluids, is distinguished by very remarkable peculiarities. The salivary fluids, concerned in the functions of mastication, digestion, and chylicification, seem to be rather more changed. Then follow the mucous secretions, spread over the surfaces of most of the viscera belonging to the natural and generative functions, as well as the cavities of the nose, larynx, and respiratory organs. The mucus in the interior of the eye, as well as that under the epidermis, do not appear to differ essentially from the preceding. Under the title of adipous fluids may be classed, besides the common fat, the medulla of the bones, and the sebaceous matter of the skin (including also the cerumen of the ears). The greasy matter formed under the prepuce about the corona glandis of the male, and the similar production in the female pudenda, may be referred to the same class; as well as the secretion of the Meibomian palpebral glands. The liquor of the amnios, and the synovial fluids, are commonly deemed gelatinous; but their real nature is not yet understood, neither is that of the fluid, hitherto unnamed, thrown out in the uterus under the venereal stimulus, known. The fluid contained in the early months of conception between the chorion and amnios, that of the vesicula umbilicalis, and that which surrounds the vessels of the umbilical chord, is as yet little understood. The contents of the Graafian vesicles, and the prostatic fluid, seem to be truly ferous or albuminous. The male semen is quite a peculiar product, not to be compared to, or classed with, any other: and the same remark will hold good also of the bile." *Institut. Physiolog. sect. 32.*

The division of this able physiologist would be natural and instructive, if the animal fluids deviated from the nature of chyle by gradations which could be easily perceived and marked. But we really cannot establish among them any order corresponding to their natural composition; and the differences observable between chyle and fat, between the aqueous fluids and bile, constitute intervals, which we cannot appreciate or measure. Indeed there are often so many differences and so few relations between one fluid and another, that we can scarcely compare them at all.

The vast progress which chemistry has made of late years, and the valuable discoveries with which the analysis



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of animal substances, as well as other parts of the science, has been enriched; might have led us to expect that the classification of the fluids would have been reformed according to their constituent principles, and brought into a condition corresponding to the rest of the science. Fourcroy has indeed given such a distribution of the subject in his *Elements of Chemistry*; but he does not seem to value the arrangement very highly, as he has not continued it in his last great work, the "*Système des Connoissances Chimiques*." In proportion as the various animal products are analysed with more accuracy, they are found to possess specific characters which distinguish them from each other; and therefore render it impossible to refer them without impropriety to any general heads: accordingly in the most recent and able chemical works, they are enumerated and considered separately. In this point of view, therefore, the exactness and perfection of modern analysis renders our attempts at a general arrangement of the animal fluids unavailing; and it has only served hitherto to shew the defects of such methods.

Dumas, in his "*Principes de Physiologie*," adopts a different plan, which he calls a natural physiological one, and to which he ascribes the advantage of connecting closely the knowledge of the fluids with that of their uses. "This method," he observes, "which is the most natural and useful of all, is to refer the fluids to the various organic systems in which their secretion takes place, to make a class of humours for each system, to consider each of them as inseparable from the system to which it belongs, and to conduct the study of both together. We shall therefore have as many different classes or species of fluids as there are organic systems in the body. This simple and natural method of considering the subject appears to me to be preferable to the more laboured arrangements founded on the essential nature and chemical composition of the fluids, because it is not exposed to that uncertainty, which the imperfection, the variations, and even the progress of our knowledge concerning the nature and properties of animal matters, mult unavoidably occasion. It is, moreover, the most easy and instructive way to consider the secreted fluids in their relations to the solid organs, with whose functions they are concerned. The distribution of the animal fluids with regard to the seven organic systems of which the human body is composed, will be better understood by presenting it in a tabular view, where their relations, influences, and uses, will be immediately perceptible.

Fluids of the nervous or sensitive system.	{	Fluid of the ventricles of the brain, Aqueous, vitreous, and crystalline humours of the eye, Tears, Meibomian secretion, Mucus of the nose, Cerumen, Fluid of the labyrinth of the ear, Saliva.
Of the muscular or moving system.	{	Fibrine, Serosity, Fat.
Of the vascular or capillary system.	{	Mucus of the trachea and air-veffels, Fluid of the pericardium, ————— pleurae, Pulmonary exhalation, Blood.

Of the visceral system or organs of supply.	{	Mucus of the mouth, pharynx, and œsophagus, ————— stomach, ————— intestines, ————— kidney and bladder, Gastric fluid, Pancreatic fluid, Intestinal fluid, Exhalation of the abdominal cavity, Bile, Liquor of the renal capsules, Urine.
Of the lymphatic or collecting system.	{	Residue of all the fluids, and of nutrition, Lymph, Fat of the cellular tissue, Mucous fluid.
Of the sexual or reproductive system.	{	Prostatic liquor, Mucus of the urethra, ————— vagina, Seminal fluid, Exhalation of the tunica vaginalis, Contents of the ovarian vessels, Liquor amnii, Meconium.
Of the bony or supporting system.	{	Gelatine, Medulla, Synovia.

Of the fluids just mentioned, some are secreted in certain organs belonging to their respective systems; e. gr. those of the conglomerate glands, of the glandular viscera, &c.; others are formed over whole organic systems, without any particular apparatus, as the exhalation in the cellular membrane, that of the circumscribed cavities, &c.; while others are not the produce of secretion, but move freely through all parts of the system in which they are concerned, as the blood and contents of the absorbing system. With the latter we have nothing to do at present; neither does the organization, from which the fluids of the middle class are produced, come under our consideration in this article, but it will be described in **INTEGUMENTS, MEMBRANI, and CELLULAR SUBSTANCE.**

The physiological theory of the secretions must be founded on a perfect knowledge of the nature of the animal fluids, and of the structure of the secretory organs. The solution of the interesting problems arising out of this subject, can be expected only from the union of anatomy, enlightened by just views of physical science, with chemistry, supported and directed by physiological observation. The secretory organs are of various kinds, and preserve a constant relation to the kind of secretion, and the manner in which it is effected. Those fluids, which seem to be derived from the blood, with the least change, are not produced by a complicated organic apparatus. The exhalation, which moistens the surfaces of the circumscribed cavities, the aqueous vapour of the lungs, and the cutaneous perspiration are formed by organic systems, composed chiefly of vascular ramifications, without possessing any thing that is at all analogous to glandular structure. The arrangement of the fibrous tissue of muscles, and of the bony fabric, admit of the same remark; if we suppose that these organs habitually secrete fibrine or bony matter. But these are cases, which come under the description of nutrition, and in this sense all parts of the body may be called secretory organs.

gans. The mucous fluids, which appear to differ more considerably from the materials in the blood, are generally separated by particular glands, which are called crypts or follicles, contained in the substance of the membranes or viscera. But it seems probable, that these also may be separated from the vascular ramifications of a simple membranous tissue without any express glandular structure, as in the case of several mucous membranes. It remains therefore for us at present to explain, in a general way, the anatomical structure of the various glands, by which the other animal fluids are secreted.

The glandular differs from most other systems, in the animal economy, in this circumstance, that its peculiar tissue is not exactly identical in all the organs belonging to it. The fibres of any voluntary muscle would serve equally well to compose any other of the same kind. Tendinous fibres, cartilaginous and bony structures, are the same every where. The substance of the liver, on the contrary, is widely different from that of the kidney; which again is very distinct in its character from that of the salivary glands. The glandular system, therefore, is marked in its various parts with very few general attributes, which also suffer many exceptions.

*Situation, forms, division, &c. of the glandular system.*—Glands have two different situations in the body. Some are subcutaneous, as the breasts and salivary glands; others deeply seated, as the liver, kidneys, pancreas, and most of the mucous glands, and consequently, not exposed to the action of the external bodies. Many of them occupy situations where there is much motion, as the salivary glands near the jaw, the mucous in close contact with a plane of muscular fibres, the liver in the vicinity of the diaphragm, &c. These facts have led to the supposition that the neighbouring motion, extraneous to their functions, determined the excretion of the secreted fluids. But, in the first place, the palatine glands, the pancreas, the testicles, and even the kidneys, are so situated, as to be out of the way of such external assistance. And we observe, further, that mucus is secreted as abundantly by the pituitary membrane, as in any other part, although there is no muscular plane here; that the lining of the bladder produces an equally copious supply, when the viscous is paralytic; and that various causes augment the secretions, without any connection with the circumstance first alluded to, as sialagogue medicines, or the sight of food in the case of salivary glands. We cannot doubt, therefore, as Bordeu has observed, that this mechanical cause has nothing to do with the matter, and that the essential cause of all excretion consists in a peculiar vital action.

Some glands are single, as the liver and pancreas; others are arranged in pairs, as the kidneys, salivary, and lacrymal glands. The latter are similar on both sides of the body; but the resemblance cannot be compared, in respect to its exactness, to that of the double organs in the animal life. One kidney is lower than the other; their arteries, veins, and nerves, are not analogous in length or size; often various notches exist in one, and not in the other: the same observations will apply to the salivary glands.

Generally the forms are not determined in a very certain manner in this system: they are subject to innumerable modifications in volume, direction, and the different proportions; and differ remarkably, in these respects, from the precise and rigorous laws which govern the conformation of the organs of animal life. Take some one organ, by way of example, from both lives. A small brain will be found to possess a corpus callosum, thalami optici, and corpora striata of corresponding size; while, on the contrary, a large liver often has a small lobulus Spigelii, and *vice versa*.

A kidney will often be larger in its upper portion only, or in the lower. These variations in the animal life affect the whole organ: while they frequently are observed in some part only in the organic. Bichat, who makes this remark, endeavours to explain the fact, by his opinion concerning the necessity of a harmony of action in the animal life. If one side of the brain were developed more than the other; if one eye, one ear, or one side of the nose exceeded the corresponding organs, the operations of the mind, the sense of sight, hearing or smelling, would be inevitably disturbed: while the secretion of bile or urine would go on equally well, although some particular part of the secreting organs were proportionally larger or smaller than the others. The glands, which are surrounded by membranes, as the liver, kidneys, and even the pancreas, are less subject to these variations of figure, than those which are contained in the cellular substance, without any membranous covering, as the salivary, lacrymal, mucous glands, &c. Those of the latter description in the mouth, and along the trachea, are never alike in two subjects. The parotid sometimes is prolonged over the masseter, and at others leaves that muscle uncovered; varies in its breadth, &c. When either of a pair of glands is so diseased, as to be incapable of continuing its function, that on the opposite side of the body either increases in bulk, as we may sometimes observe in the kidneys; or its secretion is augmented.

The surface of such glands as are not covered by membranes is uneven and tuberculated; it may be in contact with muscles, vessels, nerves, &c. even with bones, as in the salivary and lacrymal glands. In general, they are surrounded by less cellular tissue, than organs which have considerable motion. That which is in immediate contact with it is dense, like the exterior covering of arteries and veins, but it is not so firm. It does not usually contain fat; and by isolating the gland to a certain degree, it is analogous to the peritoneal covering of the liver, or to the proper membrane of the kidney or spleen. Anatomists have very commonly divided the glandular system into the conglobate and conglomerate glands. The former name denotes the gland-like bodies belonging to the lymphatic system, and was designed to shew that each formed only one mass. The latter term is most properly applied to the salivary and lacrymal glands and pancreas, which are made up of numerous smaller particles united together. It cannot well be given to the liver and kidneys, which possess nothing of a conglomerate structure; and these, accordingly, have been generally called glandular viscera.

#### *Organization of the Glandular System.*

1. *Peculiar tissue of this system.*—The glandular tissue differs from most others, in possessing no marks whatever of a fibrous disposition. Its component elements are not placed by the side of each other, according to longitudinal or oblique lines, as in the muscles, the fibrous system, the bones, nerves, &c.; but they are heaped together, by a kind of confused, and, as it were, casual approximation, and adhere together but weakly. Thus, while organs, which possess distinct fibres, have considerable powers of resistance, particularly in the direction of their fibres, glands are torn easily by slight degrees of violence. The broken surface is uneven, full of projections and depressions, which distinguish these organs from cartilage; the rupture of which is generally smooth. The prostate, tonsils, and mucous glands resist much more powerfully than the liver and kidneys, in which the phenomenon just mentioned is the most easily observable. The pancreas and salivary glands are elongated by any distending force, without tearing; but this circumstance

stance arises from the abundant cellular tissue distributed throughout their substance, and not from any peculiar property of their glandular tissue. Their lobes are separated in proportion as the intermediate cellular filaments are elongated.

The glandular tissue, which anatomists have generally called *parenchyma*, is disposed in three different ways. 1. In the salivary, lacrymal, and pancreatic glands, which are properly called conglomerate, the organ is made of distinct portions, connected together by a loose and copious cellular texture, the intervals of which transmit vessels and nerves. These are again made up of smaller lobes united in the same way; and the divisions are more easily pursued when water has penetrated into the connecting substance. Repeated divisions shew us smaller and smaller component portions, till we come at last to very small bodies, still conspicuous to the naked eye, and called glandular acini (*grains glanduleux*, Fr.) These component parts are firmer in proportion to their smallness, as they are surrounded and connected to the adjoining portions by shorter and firmer cellular substance. We can easily follow the 2d, 3d, and even the 4th division of these lobes with the scalpel. The acini are of a roundish figure and pale colour, and distinguishable from any thing of a muscular nature by the absence of fibres. When examined with magnifying glasses, they are seen divided into smaller portions by cellular interstices, and we can hardly come to an end of these divisions, if we employ successively greater magnifying powers. 2. There are no traces of the primary divisions just described, into the larger and succeeding lobes, in the liver and kidneys. They consist of an uniform and even tissue made up of glandular acini, closely united together into one substance. The connecting cellular structure of these particles, if there be any, is very small in quantity and short; hence the facility with which these bodies may be torn, and the kind of granulations which their rupture presents. 3. The prostate, tonsils, and all the mucous glands, have no appearance either of primary or secondary lobes or acini. The first of these consists of a dense parenchyma: the latter of a soft and almost pulpy substance. They cannot be torn, like the liver and kidneys.

*Controversy concerning the structure of the glandular acini.*—It is easy to proceed thus far in analysing the composition of the glands; but these researches do not at all contribute to explain the mechanism of secretion. In the hope of accomplishing that object, anatomists began, as soon as the improved condition of the science furnished the means of prosecuting such investigations, to subject the various secretory organs to a very attentive and close examination, and endeavoured to shew the nature of the acini, into which most of the glands were ultimately resolvable. The aid of magnifying glasses, and of anatomical injections, was resorted to on this occasion; but the opinions of two individuals, who had devoted much time to the subject, were completely at variance, and gave rise to a controversy, which had at least this good effect, that it occasioned a very thorough examination of the subject. Malpighi taught that the acini are hollow; that the arteries distributed on their surface deposit the secreted fluid in their cavities, and that it is conveyed thence by an excretory duct; that the union of these tubes forms larger excretory canals, &c. He deems the mucous glands of the alimentary canal, mouth, &c. to be the most simple forms of glandular structure, and considers that the larger glands differ only in consisting of an aggregation of such simple ones. "Glandula, qua palatum, œsophagus, intestina, et consimiles partes copiose ditantur, est omnium simplicissima, et idea reliquarum glandularum. Hæc

itaque folliculo membranoso solummodo consistit, quæ sibi inardum rotunda, quandoque lenticulari, et oblonga cellulari forma; concavitate pollet, quæ ut plurimum in exteriori excretorium aperitur, quo separata liquor in propria capacitate, vel foras extra pellitur. Circa centrum seu folliculum vasa sanguinea et nervi diramantur, et ut in structura assiqui licet, carnee filæ circumdantur, quæ sibi in sub plano extensi tæfensi locantur, ut in vasis illis, et of phago patet. Hæc proximè succedunt glandulæ, quæ in localorum numero ditantur, quales sunt in facie, in labiis, in quibusdam cutis partibus, circa potandum et potitum: excretorio namque vasculo, interten oblongo multiplices appendantur locali membranosi in ipsa bianate, circa quos sanguinea vasa et nervi ramiicantur." *Epistola Reg. Soc. Londin. Dicte, in Opp. Posthum.*

In the *Exercitationes de Structura Viscerum*, he endeavours to prove that the larger glandular bodies are formed on the same principles with the parts just alluded to. He examines the liver by removing the external membrane, washing it in water, boiling, &c. and employs the microscope. "In compingendo itaque hepate talis videtur firma natura methodus: vasa in ramos line inde disperguntur; ad singulas autem vasorum propagines, licet etiam exiles, lobuli appenduntur, conicam ut plurimum ferventes figuram: eundem etiam in pancreate, cæterisque conglomeratis glandulis observamus.—Glandulosi acini, quibus lobulus componitur, cum peculiarem circumscriptiõnem habeant, necessario propria et ipsis figura, quæ ut plurimum hexagona, vel plurimum laterum est: hæc etiam necesse est, ut ad invicem, præter vasorum ramos, peculiaribus membranosis vinculis coætantur, et interstitia aliqua emergant, quæ in piscibus et imperfectioribus magis conspicua sunt, in perfectioribus autem abscedunt. Ad singulos autem, hoscque minimos lobulos, multiplices vasorum rami derivantur. Tota jecoris molis ex his duobus coalescit, glandulosi scilicet acinis, et diversis vasorum propaginibus; quare, ut aliquid ex his commune opus emanet, necesse est, ut inter glandulas et vasa communis intercedat." *Exercit. Anat. de Hepate, cap. 2. Hæc de illis similes acini as existit in the kidneys, spleen, and cerebral substance of the brain.* And he defends his opinions on this subject in general, by arguments drawn from various sources, as the appearance of disease, &c. which could be alleged to prove much on either side.

The opinion opposed to that of Malpighi, considers all the viscera and glands to consist of vessels and cellular substance, without any membranous cavities interposed between the arteries and the excretory ducts. This doctrine was particularly supported and extended by Ruysch, who, though he was not remarkable for quickness of observation, most of his contemporaries in his opposition to Malpighi, which was very ample, and continued for nearly a century, and in the art of injecting and preparing the organs of the body in various ways. His observations carried little weight, because he was averse to hypotheses, and reported only what he saw. In his youth he admitted, with some exceptions, the glandular acini of the viscera. But, as he found, as he proceeded in his anatomical labours, that the membranes, naturally perfectly white, exhibited in some places, after injection, that the substance of the viscera was not entirely with injected fluids, and may be resolved into a vascular texture by maceration in pure water, he gradually changed his opinion, and began to teach that the simple and the conglomerate glands, and even those of the simple ones, are composed entirely of vessels, from which the excretory tubes are continued without any intervening medium. Injections in the dead body seem to prove the latter circumstance, as fluids in some instances pass very readily from the

blood-vessels into the excretory ducts; *e. gr.* in the kidney and liver. As Ruysch continued his investigations, he found that the bodies considered as glandular and hollow acini by Malpighi, are mere blood-vessels. After accurately injecting the liver and kidney, and macerating them in water, he found them resolved into small clusters of blood-vessels, and proved this so clearly by his preparations, that Boerhaave, who had been a warm defender of Malpighi's doctrine, in defence of which he wrote the *Epistola de Fabrica Glandularum, ad P. Ruysch.*, was induced to renounce his opinion. The elegant preparations of Ruysch, and his appeal to the evidence of dissection, and other anatomical investigations, brought most anatomists over to his opinions, which, indeed, are generally received in the present day. Haller gives the following summary of his opinions on this subject. "Viscera nempe secretioni destinata, eorumque imprimis acinos, glandulasque conglomeratas, meris componi vasculis, cellulose tunc ope connectis, eo cum vinculi robore ut consistat acinus, aque sui similibus, laxioribus filis sibi annexis, totus et integer deduci possit. In quolibet præterea acino, vasorumve glomere, ex eadem sententia, ductus excretorius est, pluresve ductuli, qui de arteriola minima, tanquam ramulus minor et sanguini impervius, decedere videtur, quæ fabrica in reâ certo reperitur, in aliis quidem colis magna cum veri specie ex conjectura admittitur. Secretio adeo a vulgari sanguinis circuitu hæreticus differt, quod in ista quidem arteriola minima cylindrica, in venam sibi æqualem, aut ampliolem continetur, quæ sanguinem recipere apta sit, in humorum vero separatione ductus excretorius, rubro vasculo arterioso minor, tanquam ramus ex eo vasculo prodeat." *Element. Physicolog. lib. 7. sect. 2. § 14.* The opinions and arguments of Ruysch may be collected in his answer to the letter of Boerhaave mentioned above, in some of his other epistles, and in various of his *Thesauri*. He has given several figures representing the distribution of the minute vessels in various organs, and proves satisfactorily that the bodies called acini by Malpighi are merely minute vessels: he shews this concerning the spleen and brain, as well as in the glandular viscera. On the subject of this controversy, we may observe, that its importance does by no means warrant the pains bestowed on it, and the noise made by the combatants in conducting it. The nature of the investigation, which is carried on entirely in the minute elements of the body, and prosecuted by means of magnifying glasses, injection, maceration, and corrosion, renders the conclusions, which we arrive at, in great measure, uncertain; and the parts, of which the structure is sought, are so exceedingly small, that neither opinions can be considered as clearly demonstrated, or satisfactorily refuted. The mode, in which secretion is effected, is equally obscure, whichever of the two suppositions we may adopt: neither of them solves the mystery. Let us admit with Ruysch that the excretory tube is continuous with the secreting artery; shall we then understand how such infinitely diversified products, all differing from each other, and from the blood, are formed from the common mass of that fluid? Shall we be able to point out the precise spot in the continuous canal where the blood ends, and the bile, urine, or milk begins? and to explain how the change is effected? If, on the contrary, we suppose, with Malpighi, that arteries, ramifying on small membranous cavities, deposit the new products in these receptacles, our ignorance of the points in question is neither more nor less complete than in the other case. Too much labour has been already spent on these idle disquisitions; modern anatomists have judged wisely in abandoning them, and in preferring the task of collecting facts concerning the natural and diseased structure and functions of our frame.

With such impressions, concerning the value of these pur-

suits, we were much diverted, at observing the complacency with which Ruysch, the great authority of the two last centuries on the structure of glands, contemplates his own doctrines, and the sang-froid with which he represents his own discoveries, as the immediate produce of a direct divine revelation. "Placuit bonitati divinæ hæc revelare meis laboribus jam senilibus. Invidi, et inimici mei hæc ridabant in initio, sed Deus cui soli omnis gloria et honor, hæc ita benedixit postea," &c. *Epistola Anatom. ad v. c. H. Boerhaave.*

The organization of all the glands is by no means so uniform as to admit of our referring the mode of glandular secretion to any one mechanism. The mammary gland and testis do not resemble the texture of the organs already described. In both of these, which again are widely different in all their sensible properties from each other, there is a vast congeries of secretory tubes, infinitely convoluted, with vascular ramifications copiously distributed among them. In the ultimate elementary parts of these glands, as far as our senses can pursue them, we discover nothing but minute, serpentine, and very slender tubes; which are particularly obvious in the testis, without any trace of Malpighian or Ruyschian acini. In the breast, indeed, the existence of these bodies has been a matter of dispute, and arguments, not deficient in plausibility, have been adduced on both sides of this important question, which, like many religious mysteries, is involved in just so much obscurity, as to make it a very suitable subject for polemical exercise.

The organs of the mucous secretion, in general, do not fall within the description already given of the glandular structure. These seem to exhibit, in many instances, a very simple form of gland, of which, however, the action is no more understood, than that of the more complicated kinds. They consist of small receptacles, lined by the membrane covering the part, receiving the secretion, and pouring it out by a single orifice in the centre. Very simple glands of this kind are seen at the root of the tongue: their figure is circular or elliptical; the cavity is lined by a thin membrane, surrounded by a pulpy vascular substance, which causes a superficial prominence, in the centre of which is a simple aperture, affording mucus on pressure after death.

In other instances, the membranous part is more conspicuous, and the glandular substance less considerable, or indeed hardly perceptible, so that the whole seems to be formed merely of membrane. These have been called *cryptæ*, *folliculi*, &c. Their figure is generally circular or oval, and they are lined by continuations of the membrane, to which they belong. They are placed in the cellular substance, and may possess more or less of the pulpy vascular matter. They have simple excretory tubes, commencing from the hollow of the membranous cavity, and terminating by open orifices on the surface of the part to which they belong, as the mouth, fauces, trachea, or intestines. Pressure forces the secreted mucus from the open orifice. To this class may be referred the glands of the lips, cheeks, epiglottis, pharynx, and œsophagus, those of the soft palate, trachea, stomach, and intestines.

These more simple kinds of crypts or follicles are united in different instances, so as to compose larger masses. Sometimes they are simply contiguous, connected by loose cellular substance, and possess each its proper duct: *e. g.* at the back of the tongue, and about the arytenoid cartilages. Such have been called *glandule congregatæ*. In other instances, numerous follicles, included in a common covering, deposit their mucus in one or more large cavities, into which several follicles open. The tonsils afford an example, and have been called *glandule conglutinatæ*.

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The secretion of mucus is often performed in a species of structure, which does not seem to possess any thing of a glandular nature: in small membranous canals, which will admit bristles for about half an inch in length, ending by blind extremities in the cellular substance, and terminating by oblique apertures on the surfaces of the mucous membranes to which they belong. Neither acini nor round follicles can be discovered opening into such canals, which are technically named *sinuses* or *lacunae*, and which, in the urethra, have a perfectly smooth surface. Some of these are simple, as in the septum narium, the urethra of both sexes, the entrance of the vagina, &c.; others are ramified, as in some instances in the male urethra; in the neck of the uterus, &c.

The glands, which produce various matters of an unctuous description, appear to be very simple in their structure, but they are mostly so small as to prevent us from entering into much detail concerning their organization. The ceruminous glands of the ear are small round bodies, dispersed in the interstices of the cellular substance, and each of which possesses a duct, penetrating the integuments of the meatus auditorius, and ending on its surface by an open mouth. They seem to consist of simple membranous cavities. The organs, which secrete sebaceous matter, in various parts of the integuments, do not seem to differ essentially from these. They are round membranous cavities, with their sides covered by numerous vascular ramifications, opening on the surface of the part to which they belong, with or without the intervention of a simple duct. Where they produce a fluid which concretes, it may be expressed from them in the form of a slender white thread. The areola of the nipple, the nymphæ, and the other external female organs, the corona glandis of the male, the nose, and particularly the cavity between its ala and the cheek, the upper lip, and the hollows of the external ear, possess numerous glands of this description. The Meibomian apparatus of the eye-lids is only a rather complicated specimen of the same structure; several simple glands open into a common duct.

The prostate possesses a peculiar structure, which can hardly be referred with propriety to any of the species first enumerated.

The glandular tissue, cut in slices and dried in the air, loses its original colour, acquires a dark hue, and even a blackish tint in the liver and kidney, on account of the large quantity of blood which they contain: if the latter viscera are repeatedly washed, before they are dried, they continue to appear greyish. The glandular tissue, in its dried state, is remarkably hard and brittle. If kept moist and exposed to the air, it becomes putrid very rapidly, and exhales in that state a highly disagreeable odour. A greater quantity of ammoniacal matter is formed. The liver is particularly distinguished for the insupportable stench caused by its putrefaction. The kidney goes less rapidly into that state. When boiled, the glandular substance produces at first a greyish substance, which troubles the water uniformly at first, and is then collected in an abundant froth at the top. This product is most abundant in the prostate, the muscular, mucous, and cellular systems; and least in the cartilaginous, tendinous, fibrous, &c. The froth produced by its boiling is of a deeper colour, and seems to contain more numerous principles, than that derived from the white organs.

Like all other systems, the glands grow hard at the first periods of ebullition, but instead of becoming softer afterwards, as the others do, the continued boiling makes them more and more hard; so that after five or six hours of ebullition, their firmness is triple or quadruple that which belongs to them naturally. This phenomenon is most remarkable in the liver. When removed immediately after the first corru-

gating effects of the hot water, they do not display the elasticity which the other systems possess at this time. A tendon or muscle in such a state, if drawn, restores itself immediately, while a slice of liver breaks. The absence of fibrous matter perhaps is the real cause of this difference. The sudden action of naked fire crisps and corrugates the surface, as in all the other solids, and produces a hard exterior crust.

Maceration in water produces different effects on the different glands. The liver softens longer than the kidney, which, after two months, is reduced to a reddish pulp swimming in the water, while the former still preserved its form and density, and had undergone no other change than from a red to a bluish brown colour. The salivary glands exhibit much of the whitish, unctuous and firm matter, which is seen in all cellular organs after long maceration. This does not arise from an alteration of the glandular tissue, but from the fat contained in the abundant cellular texture of these parts.

Acids act on the glandular tissue nearly as upon the others. They reduce it into a pulp, varying in its colour, and in the promptitude of its formation according to the nature of the acid employed. The sulphuric acts most quickly, and gives a black pulp, while the nitric renders it yellow. They act much more slowly on the glands after boiling than before.

Generally speaking, the glands are much less digestible than most other animal substances; particularly in their boiled state: for coction produces in them quite opposite effects to those which it exerts on the cartilages, tendons, and all the fibrous organs, which are rendered less dense, more gelatinous and viscous, and more speedily dissolvable by the gastric juice. The glands would probably be digested more easily, if eaten raw. Liver is less digestible in proportion as it is longer boiled. Bichat made a comparative trial of it in a raw and dressed state: the former was reduced into a pulp in the stomach of a dog, when the latter had undergone a very slight alteration.

*Excretory tubes.*—All glands have tubes for the purpose of conveying away the fluids, which they separate from the blood; and as these canals are only found in glands, their consideration belongs to that of the peculiar tissue of the gland. The excretory ducts have an uniform origin in all glands. They arise like veins, by an infinite number of capillary tubes, which appear to begin at the acini, where these exist. Each acinus is said to have an arterial and venous, as well as an excretory tube. Arising in this way from all the interior of the gland, they soon unite together, into more considerable tubes, which generally run in straight lines through the glandular tissue, unite to each other, and form at last one or more large tubes.

Glands are to be distinguished into three kinds, with respect to their excretory tubes. 1. Some transmit their secretion through several ducts, each formed by smaller ones, and opening near together, but distinctly, and without any communication. In some cases these separate apertures are found on a more or less distinct prominence, as in the breast, prostate, and sublingual glands. Sometimes the orifices are found in a depression, in a kind of *cul-de-sac*, as in the tonsils, the foramen cæcum of the tongue, &c. 2. Other and more numerous glands pour out their fluids by a single tube, and there is nothing remarkable in general in the orifice. 3. Some glands deposit the produce of their secretion in a reservoir, where it is retained, in order to be expelled at particular times. Such are the kidneys, liver, and testicles. In this case there must be two excretory tubes; one to convey the secretion from the gland to the reservoir, and the other to transmit it to its final destination. These reservoirs are therefore evidently connected with the excretory tubes.

Although the two first classes of glands have no reservoirs, we may in some degree regard the different ramifications of their excretory tubes as supplying their place. These, indeed, as well as in the glands, which have reservoirs, are habitually full of the secreted fluid. Under whatever circumstances the individual may have died, we may always produce a considerable flow of prostatic fluid by pressure on the gland. The papilla of the kidney affords urine on the pressure, sections of the liver show bile in the hepatic duct, and the lactiferous vessels are full of milk, for which there is no other reservoir. From variations in the quantity of fluid, in the latter instance, the greater or less size of the breast, during suckling, entirely depends.

It appears in general that the passage of the secreted fluids in the excretory ducts is much slower than that of blood in the veins, or of lymph in the absorbing vessels. Urine is constantly flowing through the ureters; but a much greater proportion of blood would pass through a vein of equal diameter, while the bladder was filling. The rate of motion however varies under different circumstances, the saliva is excreted much more quickly during a meal, and urine passes off much faster after watery drinks.

The size of the excretory tubes varies very considerably. 1. Where several are produced from one gland, they are very small, and sometimes scarcely perceptible. They run in a straight line, have no communications, and open immediately on quitting the gland. 2. Those which are single are larger; bearing a proportion however to the size of the gland, excepting the hepatic duct, which is manifestly very small in comparison to the bulk of the liver. They pass for some distance after quitting the gland, and are produced by the union of such tubes as belong to the last mentioned class; so that if their isolated excretory tubes were to be united together, a common single duct would be formed resembling those of this second kind. The pancreas is the only instance in which the common duct is concealed in the substance of the gland: and there is no other instance, but the testis, where it forms convolutions, so as to be much longer than the course through which it passes.

Whatever the arrangement of the excretory tubes may be, they all pour their fluids either on the surface of the body, as in the seruminous and sebaceous glands, and the breast; or on the surface of mucous membranes, as the mucous, salivary, pancreatic and hepatic excretories. The skin and mucous membranes, therefore, are the only parts moistened by glandular fluids; no ducts terminate on serous or synovial surfaces. The excretories of the pretended articular glands would form an exception to this observation, if the glands existed. They never terminate in the cellular membrane; and if a communication should take place, by accident, abscesses are formed by the supervening irritation, as in urinary fistulae; or inflammation occurs in the track of the extravasated fluid, producing adhesions, which preserve the cellular system from more extensive infiltration. Thus the alimentary canal may be regarded as a kind of general excretory, super-added to those of the liver and pancreas, &c., and expelling in one mass all the fluids separately poured through their respective ducts into its cavity. Indeed, all secreted fluids seem designed to be thrown out of the body. Separated from the mass of blood, they are heterogeneous to it, and do not enter the general circulation again in a state of health.

All the excretory ducts have an internal mucous membrane, which is a continuation of the cutaneous or mucous surface, on which they terminate. In addition to this they all possess an exterior substance, including the mucous canal, and differing considerably in the particular glands. It is a very thick and peculiar substance in the vas deferens: an

extremely dense and close texture, resembling that of the arteries and veins in the hepatic and salivary tubes, &c. The latter is very different from ordinary cellular substance. It does not appear that these tubes possess any membrane besides the tissue just described, and the mucous lining. Every excretory tube has its blood-vessels. The ureters receive very manifest arterial branches from the renal and spermatic arteries: the hepatic artery supplies the biliary tubes, and the Stenonian duct has its branches from the transversalis fasciæ. Various nerves from the ganglia accompany the blood-vessels; but they never form such intricate plexuses as round the arteries.

The excretory ducts possess chiefly the vital properties of the mucous system, which has the greatest share in their formation. Their sympathies are, therefore, nearly of the same kind.

## 2. Of the other Systems belonging to the formation of the Glands.

*Cellular substance*—Glands differ much in the proportion of this tissue, which they contain, and may be divided accordingly into two classes. It is very abundant in the salivary organs, in the pancreas, and lacrymal gland, and in all such as have a conglomerate or granulated structure and white appearance. Every gland of this class is divided into lobes very distinctly isolated by grooves filled with this texture, and determining the tuberculated surface which characterizes the exterior of the organ. Each lobule, and every glandular acinus, down to the smallest division, is covered by cellular substance; hence the whole consists of an assemblage of small distinct bodies, connected together only by the circumference of their excretory tubes being united to form a common duct, and which we could conceive to be perfectly capable of exercising their functions if actually separate. We see this in the parotid; where small accessory portions are often seen in the course of the duct, completely unconnected with the principal gland. The submaxillary and sublingual are sometimes continuous, sometimes isolated. The cellular tissue in these glands often contains an abundance of fat. This is particularly observable in the breast, the volume of which sometimes depends on the size of the gland, sometimes on an accumulation of the adipous substance; a difference, which is very easily recognized by the touch. Hence the quantity of milk is not always in proportion to the apparent size of the mamma. In the proper conglomerate glands, however, the adipous substance seldom amounts to a very considerable quantity. The connecting threads are very short and slender in the testis. In those glands, which have a dense parenchyma, as the liver, kidney, prostatic, and mucous organs, there is very little cellular tissue, and hence the facility with which some of them may be torn. Their substance never contains fat. The unctuous state of the liver in various diseases does not invalidate this observation; for the fat then enters into its composition as an essential element of the organ, and is substituted in place of the coagulating matter, which disappears; it is not contained in cells. Fat may be seen also in the interior of the kidney, but it is round the pelvis, and not in the proper parenchyma of the gland. The tonsils, prostatic, and mucous glands never contain any. Serous fluids are never thrown out in the substance of glands, which have a close parenchyma; they are not affected in cases of the most general and extensive anasarca. We cannot, however, doubt the existence of cellular tissue in such glands: maceration demonstrates it. The fungous tumours, growing from these organs, contain much of it; and it is principally seen round the vessels, as in the capsula Glissoni. This texture, indeed, is often diseased, while the proper substance of the gland remains sound:



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found: hence the development of scintomatous tumours in the liver, of ferous cysts in the kidneys, and of hyalids in both, without the secretion being at all disturbed. The liver is sometimes increased three or four-fold by internal tumours, without its proper tissue being augmented: the latter forms a kind of Septa between the swellings in which the biliary secretion goes on.

*Blood-vessels*—Glands, which are not surrounded by a membrane, receive their arteries from all quarters. An abundance of small branches from the neighbouring trunks penetrates the surface of the salivary and lacrymal glands, the pancreas, &c. They first run between the lobes, penetrate into the smaller divisions, and are finally dispersed on the acini. The branches coming from different quarters anastomose freely in the gland.

Where the organ is surrounded by a membrane, as in the liver, kidney, testis, &c., the arteries penetrate on one side only, generally at a more or less deep notch, and in a single considerable trunk, which, however, is sometimes previously divided into a few smaller branches. The part at which the artery enters, is always the farthest removed from the action of external bodies: a remark, which is common to all important organs, as the lungs, intestines, spleen, &c. The convex surface of these, where the vessels are the smallest, and where hæmorrhage would consequently be attended with the least danger, is always turned outwards. When it has entered the gland, the main artery quickly divides into various branches, which diverge and are subdivided as they approach the convexity. They have various branches in the body of the organ, as they proceed, and end by producing a large number of capillaries, covering the surface of the organ. Sometimes they come through, are visible on the surface, and ramify between it and the investing membrane. The most favourable method of observing the distribution of the arterial system in these organs is to inject them with hard injection, and to destroy the animal substance by means of immersion in muriatic or nitric acids: a cast of the vascular system, even to its very minute divisions, may be obtained in this way, and such preparations, on account of their elegance, are contained in all cabinets. Ruych, who was remarkable for his dexterity in these processes, found that the small arteries were differently arranged in the different organs. In the kidney they are convoluted, so as to form, through the whole substance of the organ, small granular bodies less than a pin's head, which are the acini already alluded to. The surface of the liver is covered, after a successful injection, with innumerable capillaries arranged in a stellated form, and giving the appearance of little tufts of minute arteries, when the part is corroded, which have been compared to camel's hair pencils; and this arrangement has been termed the penicillous. A similar disposition is observable in the spleen.

Some have conceived that the large arterial trunks of glands communicate to the organs an interior motion very favourable to the execution of their functions. These bodies are placed, for the most part, in the trunk, and therefore near to the heart; and their vessels generally enter after a short course, so that the impulse has been considered, from this cause, to be more powerful. The spermatic artery is a remarkable exception to this observation, and the slowness of the femoral circulation has been explained from this cause. We own that we cannot discover any very convincing arguments in proof of these positions.

The veins accompany the arteries throughout, in their distribution to the glands; we have no distinction here of a superficial and deep-seated set. The liver is the only exam-

ple in which red blood enters on one side, and black goes out in the opposite direction.

*Kind of the Glands*—The quantity of blood contained habitually in these organs differs remarkably in different parts of the system. 1. The cerebral and testicular glands contain very little. It imparts colour to the testis, which are whitish in their appearance, and other glands are found to be changed two or three times in their colour. 2. The mucous glands produce a fluid of considerable quantity. 3. The liver and spleen have a great quantity of blood, that they differ widely in their functions from the rest of the glandular system. They contain a large quantity of blood after death from hæmorrhage, or else the glands are suddenly removed from a living animal. Hence, when we macerate these organs, it is necessary to wash the water at least two or three times before it ceases to be bloody; when we preserve them in alcohol, long previous maceration is necessary, to prevent the spirit from becoming turbid by the blood. This large quantity of blood occasions the glands, now under consideration to be heavier than the other parts of the system; hence, too, arises their distinguishing red colour, which is not more essentially inherent in their tissue, than in mucous surfaces or muscles: in fact repeated washings will discharge it as effectually. The liver then exhibits a greyish appearance, which appears to be the proper colour of its tissue, as white is that of the muscular fibre. The hue of the kidney seems to be less immediately influenced by the blood. It retains a degree of redness after frequent renewals of the macerating water; and the pulp produced by leaving it in water for some months, with frequent changes, still has a red tint, although less deep than in the recent state. Does the state of the secretion influence the quantity of blood contained in glandular organs? Is there more blood sent to the kidney, when the urinary fluid is separated abundantly, than when it passes off slowly? or is there less returned by the veins in the former case?

*Nerves*—Glands receive two kinds of nerves. 1. The lacrymal and salivary glands, the testis, &c. are supplied almost exclusively from the cerebral nerves. 2. The testicles, prostate, and liver, derive nearly an equal portion from the brain and the ganglia. 3. The kidney and most of the mucous glands, &c. are almost entirely supplied from the ganglia. These remarks apply to those nerves only, which are unconnected with the arteries; for each arterial trunk penetrating a gland, is surrounded by a nervous network belonging to the system of the ganglia, and very manifest in the larger organs, as the liver and kidney, where the plexus come from the femoral ganglion, in the salivary glands, where it is derived from the superior cervical, in the testis from the lumbar, &c.

The nerves are small compared to the size of the glands. We must not decide on this subject from those which enter the parotid and submaxillary; for the nerves merely traverse these organs, leaving a few branches behind them. But the liver obviously possesses as small a supply as any organ in the economy, which receives nerves at all. Nerves enter the glands, like the vessels; that is, they come in on all sides where there is no surrounding membrane; and enter at the notch in other cases. They divide and subdivide, as soon as they reach the gland, and are quickly lost. There are never any ganglia in the interior of these organs.

We know but little of the exhaling and absorbing vessels in the substance of glands, where they are merely subservient to the purposes of nutrition.

### *Properties of the Glandular Tissue.*

1. *Properties derived from their Organization.*—These are

very slightly marked in this system, probably from its texture not partaking at all of the fibrous nature. In order that an organ should be susceptible of elongation and subsequent contraction, without injury, its component particles must possess a certain degree of cohesion; and this attribute particularly belongs to fibre. The glandular system, too, is subject much less frequently to causes of distention and contraction, than those which are made up of fibres. When the liver contains a large quantity of blood after death, in consequence of the venous system being overloaded, its bulk remains the same: its substance is compressed by the vessels. The enlargement of the testicle in gonorrhœa, and of the parotid glands under certain circumstances, and their speedy subsequent reduction, prove that these organs possess a certain degree of extensibility and contractility. Are the liver, kidney, and other internal glands subject to similar acute enlargements? The phenomena now alluded to may take place in the cellular tissue of the glands, and therefore suppose a less degree of extensibility in the proper substance of the gland than might at first have been supposed.

2. *Vital properties of the glands, and physiology of secretion.*—The remainder of the investigation is much more difficult than what we have already gone through. The nature and properties of the fluids, and the structure of the secreting organs, may be determined in a great measure by the evidence of our senses: but when we endeavour to explain why each particular fluid is separated by its respective organ, the determination of the question implies a knowledge of the hidden structure of the minute elements of our body, about which we must either be silent, or attempt conjectural explanation, at some risk of exposing ourselves. The object then is, to shew, why, in the healthy state of the body, saliva, and no other fluid, is constantly separated from the blood in the parotid gland, bile in the liver, and urine in the kidney; and how it happens that the nature of the secretion never changes, so that urine should be formed in a salivary gland, saliva in the kidney, bile in the mammary glands, &c. The difficulty of the undertaking is increased, and the prospect of arriving at a satisfactory conclusion diminished, by this circumstance; that in the different classes of fluids, each is not constantly separated in an organ of a particular structure. If that were the case, it would only be necessary to determine the relation which the structure of the gland bears to the nature of the secreted fluid: but the very contrary is the case. Fluids of each kind are produced by every variety of glandular apparatus: thus water is formed by the arteries of the skin, without any glandular arrangement, by conglomerate glands, in the instance of the salivary apparatus, and by a glandular viscus in the case of the kidney: mucus is secreted by membranous surfaces, and by different kinds of glands; and lastly, oily matters are poured from the arteries of the cellular membrane, from various sebaceous glands, from the vessels of the skin, from the liver, &c. Again, there are instances in the body, of organs, which we should, *à priori*, have pronounced, without hesitation, to be glandular, and which yet perform no secretion. Such are the spleen and thyroid gland, to which we may perhaps add the thymus and renal capsules. The spleen is a remarkable instance of the arrangement of the minute arteries, called the penicillous, which is seen also in the liver, and considered to have much connection with the peculiar functions of the secretory organs. In this place, too, we should mention the curious facts, concerning the formation of certain fluids, under particular circumstances. By other glands than those which ordinarily produce them.

Haller has collected, in his great work, a vast number of facts of this description; of which, if we should reject all that may seem insufficiently authenticated, there will remain quite enough to prove the point decisively. To the chapter in which these details are contained, he prefixes this sentence: "sive quilibet humor per quodcumque eorum separari potest;" and the cases which he cites, fully justify his concluding paragraph: "Quando hæc exempla repetemus, constabit, non eisdem unice classis diversos humores sua inter se eola commutare, sed etiam per mucii organa aquam, per mucii, aquæ et adipis eola lympham et sanguinem, per aquæ, mucii et lymphæ vias adipem, blem sanguinæque fecerunt, atque adeo omnino, nullum in animato corpore separatorium organum esse, quod non omnium classium humorum suis cum doctibus seerere queat." *Element. Physiolog. lib. 7. cap. 1. §. 9.* When these circumstances are considered, it will very probably be suspected that the causes of the differences in the secreted fluids cannot be traced in the obvious structure of the glands; but that the reason why a peculiar fluid and no other is separated from each gland, in the healthy state of the body, lies much deeper, and flows from some conditions of the organs, which are inaccessible to our senses. We shall endeavour to illustrate the subject as far as well authenticated facts will assist us, and shall mention the opinions which have been most prevalent on the subject. It will be an easier task to shew how unsatisfactory most of these are, than to substitute any thing more rational in their place. We proceed to point out the vital properties of the glands.

No part of the system possesses animal contractility, or the power of voluntary motion. Different glands seem to be differently circumstanced with respect to the corresponding species of sensibility. The peculiar and oppressive sensation occasioned by compression of the testicle, is well known. Considerable and continued pressure on the parotid gland has produced great suffering; but large nerves pass through this organ. The liver may be injured in a living animal, without causing any of the usual signs of pain; and Haller makes the same observation concerning the glandular system in general, but his statement is not perfectly explicit: "Universæ glandulæ experiuntur minime irritabiles videntur, neque vehementer aut morbos sentiunt, aut illatas a profectore injurias." *Elem. Physiol. t. 2. p. 377.* Stones in the kidneys often cause very severe pain. From these apparently contradictory circumstances, we can only conclude that animal sensibility, which is variously modified, may exist in organs, where certain agents do not excite it at all, while others develop it very readily. In fact, various morbid alterations render this property very manifest in the glands. The pain of inflammation bears, indeed, a peculiar character in the glandular system; it is generally obtuse and heavy.

*Properties of the organic life.*—Sensible organic contractility does not exist in the glandular system; but the two other organic powers are exhibited in their highest state of development, and are almost constantly in operation, being concerned in secretion, excretion, and nutrition. Organic sensibility enables the gland to distinguish in the mass of blood those materials which are suitable to its secretion; and by its insensible contractility, it has the power of rejecting whatever is heterogeneous. The blood contains the materials of all the secretions, of the nutrition of all organs, and of all the exhalations. From this common reservoir each gland draws what is requisite for its secretion, each organ for its nutrition, and every serous surface for its exhalation. The peculiar mode of organic sensibility enables each living part to distinguish what its functions require. The whole business of glandular action rests on the two powers just mentioned;

mentioned; and as this action is nearly constant, they are almost incessantly exerted.

It is evident that all glandular affections must imply a disorder in the powers above-mentioned; since diseases of an organ are particularly determined by alterations of the leading properties; of those which constitute the peculiar life of the part. Observation proves this: we see these properties, when augmented or diminished, producing on one side increased secretion, as in diabetes, mercurial salivation, cholera morbus, &c.; on the other, a decrease or even suspension of the function, as in acute diseases, where all the secretory tubes seem, as it were, closed for a time; for instance, in suppression of urine, dry state of the mouth, &c. On other occasions the nature of the glandular sensibility is changed, and it harmonizes with substances which are not admitted in the healthy state: hence the innumerable varieties of the secreted fluids under circumstances of disease. The cystic bile in the dead body presents numerous varieties of taste, smell, colour, and consistence. The numerous alterations of the urine are well known. The saliva is less liable to change; but how different is it in many diseases from its ordinary condition. Nothing can less resemble urine or bile than the fluids often discharged from the bladder and liver: whence then arise these differences? from the variations in the organic sensibility bringing the part into a relation with those substances, which were foreign to it in the natural state. Thus the same gland, without any change in its structure, but merely by altered modifications of its vital powers, may be the source of infinitely varying fluids. Might not this be carried so far as to allow that the kidney, by assuming a sensibility analogous to that of the liver, may actually form bile? why should it not secrete bile, since it does separate other fluids so widely different from the urine?

In the healthy state, the mode of sensibility in each gland is nearly uniform; and the secreted fluid is consequently nearly the same in its composition and properties. But the mode is changed by numerous causes in disease. An hysterical attack comes on; suddenly the kidney refuses to transmit the principles which colour the urine, and that fluid is consequently discharged limpid; as the paroxysm subsides, the natural type of the sensibility is restored, and the urine has its accustomed characters. In an epileptic fit, a thick frothy saliva is discharged from the mouth in abundance; as the attack goes off, the salivary secretion returns to its natural state.

The various changes in the organic sensibility, and the sensible contractility of the glands, do not affect the function of secretion only; but when they last for some time, they influence nutrition also. From the disturbances of this process arise those various organic affections, of which the glandular system offers the most abundant harvest to the pathological anatomist. We cannot avoid noticing, in dissecting rooms, the numerous diseases observed in this part of the body compared to others. The glands, the skin, the mucous, serous, and cellular system, hold the first rank in this respect; and in all these the two properties above-mentioned exist in the highest degree, and are called into action, not merely by nutrition, but also by various other functions, which reside in the capillary system, as exhalation, absorption, and secretion.

The preceding account of the physiology of secretion, chiefly derived from the "Anatomic Generale" of Bichat, seems to amount to little more than this, that each secretory organ produces its peculiar product, in consequence of its possessing peculiar vital properties, which, when variously modified under particular circumstances, enable the organ to separate very different fluids from the blood. And this we

believe to be a pretty correct statement of the extent of our knowledge of this subject. But anatomists and physiologists, not satisfied with this simple fact, have endeavoured to develop the exact mechanism of the process, and it will be necessary for us to recount some of their opinions. In all observations on this subject, it will be well for us to remember that secretion is not confined to the animal kingdom, but prevails also in the vegetable world. We frequently observe the sap giving origin to peculiar and different juices in the various parts of the same plant, and reasoners from analogy have gone so far as to admit the existence of a glandular system in vegetables. We shall be induced, by this circumstance, not to lay too much stress on the peculiar structure of the secretory organs in the more complicated animals, as essential to the business of secretion. Many of the facts already noticed, concerning the separation of perfectly similar, or at least very closely resembling fluids, by means of totally dissimilar organs, will tend to the same deduction. And this mode of argument may be still further supported by various examples in comparative anatomy; where we find fluids of the same class secreted in animals of different orders, in organs of very different external appearance. The kidneys of birds are really conglomerate in their structure; and a fluid, exactly resembling the pancreatic of warm-blooded animals is formed by the tubular pyloric appendages, variously constituted in different genera of fishes.

Of the different explanations, by which physiologists have successively attempted to elucidate the function of secretion, most are completely hypothetical and improbable. In most instances it has been assumed that the various animal fluids are all contained in the blood; and secretion, according to this opinion, consists simply in their separation by means of the glands. Differences in the diameter, length, and folds of the vessels, and supposed varieties in the holes with which the glandular system is supposed to be perforated, have been employed as the means of rendering the mechanism of secretion intelligible; hence the expressions of *seves*, *filter*, and *strainers*, so frequently employed in physiology. We are dispensed from the necessity of commenting on the glaring absurdity of comparing a gland to a sieve or filter, and of deciding which of these mechanical explanations is the most exquisitely foolish, by the completely gratuitous nature of the fundamental proposition. The modern analysis of the blood have no longer even the shadow of an excuse for regarding this fluid as a mixture of all the animal liquors, and for supposing that it is formed of saliva, bile, gastric juice, urine, &c. since we can discover no trace of such fluids in it. Although all the elements necessary to form these products, as well indeed as those of the solids, are in fact found in the blood, they exist in it in a different state of combination. The blood is manifestly an homogeneous liquor, capable of forming all animal matters from the most transparent and pure water, as the cutaneous exhalation, to the firm fabric of the bony system; from it are formed saliva, bile, and urine; and it serves also for the nutrition of muscles, membranes, and nerves; but none of these modifications of animal substance are contained in it perfectly formed.

Their precipitation, says Fourcroy, in the tubes to which they belong, cannot be regarded as a simple precipitation; since it is accompanied by a modification in the properties, nature, and composition of each. Thus the animal pulp is not exactly the same albuminous matter as that in the serum of the blood; the gelatine is not dissolved in this fluid, as in the mammaceous; the malleolar fibre is not completely identical in its character with that which exists in the blood; and the phosphate of lime is not associated in the latter to the gelatinous substance, which unites its particles.

els in the bony system. Hence secretion always implies some change or modification in the mass which results from its exercise. *Conn. Chim. Sect. 8. ord. 4. art. 5.*

Another notion, as a substitute of all solid foundation to the former, is, that the blood undergoes certain changes as it passes at the glands; that it assumes a peculiar composition before it penetrates the organ. It has been asserted that the blood-vessels are so arranged as to produce particular modifications in the contained fluid, and that this is a disposition preparatory to the final process. The hepatic secretion has been considered to afford the clearest example of such previous changes. The structure and number of the vessels which surround and enter the organ, the proportion of those which carry blood or white fluids, the different temperatures supposed to depend on these proportions, in a word, all those points of organization which can possibly influence the nature of the blood, are said to be sufficiently diversified in order to produce in the chemical properties of the fluids a disposition favourable to the formation of saliva in the neighbourhood of the salivary glands, of urine in that of the kidney, &c. This disposition, depending on the vascular apparatus, has been represented to consist particularly in a retardation, acceleration, cooling or warming of the blood, or in the loss, by absorption, of some of its principles. But what sensible cause can produce these effects? Does not the blood flow through the trunks which are going to the glands just as in other vessels? In short, what is the change? The supposition in question is a complete assumption; not supported by a single fact, and contrary to observation as far as our knowledge hitherto extends. For we can detect no difference in the blood drawn from the carotid, spermatic, hepatic or renal arteries. We have been surprised to find this opinion adopted and supported by Fourcroy; but the whole of his remarks on the subject in the "*Système des Connoissances Chimiques*," *sect. 8. ord. 4. art. 5.* do not contain a single proof, and afford an example of vague and completely illogical statements. We do not mean to deny that there may be particular conditions of the whole mass of blood favourable to certain secretions. Thus, after drinking copiously of watery fluids, we find a much larger portion of urine secreted; and the cutaneous exhalation is often augmented from the same cause.

In our endeavours to discover the mechanism of secretion, it will be best for us to select the most simple mode of this function. Now the exhalation from serous membranes, and the mucous fluid covering the surface of many cavities in the body, are examples of this kind. We can discover nothing in these organs but vascular ramifications united by cellular substance. Injected fluids in the dead body follow the same route which the secreted liquors follow in the living state. And the same observation may be applied also to the case of secretions in some of the more complex instances. "Water," says Haller, "tinged with colouring matter, singlafs, or oil of turpentine, thrown into the arteries of a young subject, and occasionally even suet, in the experiments of Ruyfch and Albinus, have exuded in numerous small drops from the skin, after the removal of the cuticle in warm water, so as to imitate very closely the proceedings of nature. I have also repeatedly seen water, coloured with blue, and injected into the lungs through the inferior cava, run out with much froth from the trachea. In the kidney, water, air, or suet will pass through excretory tubes continuous with the arteries into the infundibula and pelvis. Oil of turpentine and quicksilver have passed into the chamber of the aqueous humour from the arteries: in

the same way injected water imitates the course of the tears, and exudes abundantly from the whole internal surface of the eye-balls." *Ibidem. Physiol. t. 2. p. 374.* Physiologists have indulged in considerable disputes concerning the kind of secretions. "Some," says Blumenbach, "assert that all separation of fluids from the mass of blood is accomplished merely by pores in the blood-vessels, and those, as they say, of an inorganic nature; while others deny altogether the existence of secretory pores. I suspect that this difference of opinion must be resolved into a verbal dispute. On the one hand, I must confess, unequivocally, that I know not what notion to form of inorganic pores in an organized body, since all the openings in such bodies must belong to their organic nature, and be regulated by their vital properties. On the other side I do not conceive that the orifices or pores in the coats of the vessels, the existence of which cannot be doubted, differ essentially, in regard to their functions, from the cylindrical ducts, in which secretion is performed in the conglomerate glands, and in the glandular viscera: since it is probable that the separation of fluids depends more on the vital properties than on the forms of the secretory organs." *Institut. Physiolog. sect. 32. § 469, note b.*

However simple the process of secretion may be deemed in the case just specified, and however closely the proceedings of nature may be imitated by the experiments with injections, we shall still find ourselves entirely ignorant of the essential circumstances of the process; *i. e.* we cannot explain the formation of the new product from the blood, and the formation of such totally different new combinations in organs where no difference of structure can be detected.

Those, who wish to see the various attempts at explaining the mechanism of secretion, may find ample gratification in the third section of the seventh book of Haller's great work: where he gives his usual detail of all that has been written on the subject. The reader will be very willing to spare us the task of recounting all these dreams, and the still more disgusting toil of refuting them. We shall merely mention one opinion, on which physiologists lay some stress even in the present day. This refers to the difference of the secreted matters to the peculiar arrangements of the minute arteries of the glands. Ruyfch, who excelled in the art of making anatomical preparations, was led to remark, in his employment of injections, that the ultimate arterial ramifications differ in the different secretory organs, and indeed that there are characteristic differences in this respect in all the structures of the body. This explanation may possibly be true, and we cannot perhaps completely overthrow it: but this is all that we can say in its behalf. We must observe, in the first place, that a correct account of the facts, and an exact description of the different vascular networks, is yet a desideratum; for the question concerns the very smallest capillaries, from which the tubes conveying the new product commence. Now the larger ramifications, such, for instance, as will admit several globules, do not differ sufficiently from each other to account for the diversity of the fluids produced in the various organs. Indeed similar vessels often produce the most opposite products. The structure of the cortex cerebri, of the spleen, and of the placenta, is very much alike with the most dissimilar results. The veins, too, are arranged like the arteries, as we should conclude, certainly not for the purposes of secretion. Very different arrangements of blood-vessels may be seen in various membranes which produce the same kind of exhalation.

Recourse has been had to the science of chemistry, in order to explain the function of secretion, but no assistance has been hitherto

hitherto derived from this source in unfolding the mystery. That the changes, by which the new products constituting the animal fluids are produced from the blood are purely chemical, cannot be doubted, but we are equally in the dark as to the circumstances which determine or modify these alterations. We cannot doubt indeed that the whole essentially depends on a vital power of which chemistry can neither detect the nature, nor appreciate the force. If, however, we cannot be very sanguine in expecting from this science a development of the immediate agent by which secretion is effected, much light may, probably, be thrown on some parts of the subject by accurate chemical investigations. We may apply generally the observation of Dr. Thomson concerning the kidneys: "the changes operated on the blood in the kidneys are at present altogether unknown; but they must be important. Provided the method of analysing animal substances was so far perfected as to admit of accurate conclusions, considerable light might be thrown upon this subject, by analysing with care a portion of blood from the emulgent artery and vein separately, and ascertaining precisely in what particulars they differ from each other." *System of Chemistry*, vol. 5. p. 749. Fourcroy, too, in considering how far secretion admits of explanation on chemical principles, speaks rather of what may be done than of what has been effected in this way. "Hitherto chemistry can only furnish some general statements on this subject; and, if we look to this science for an explanation of the causes and products of the secretions, and for a demonstration of what passes in every kind of secretion in particular, we must wait till the experiments are much more numerous, the investigations more exact, and the animal analyses considerably multiplied. We must determine the temperature, consistence, and nature of the cerebral blood, of that in the vena portarum, and in the renal arteries, before we can understand the mechanism of the secretions performed in the brain, liver, and kidneys." *Syst. des Conn. Chim.* v. 10, p. 385.

We should always bear in mind, in our attempts at chemical explanations of the animal functions, that the effects of the vital power are more particularly observable in counteracting and preventing the exertion of those affinities, by which dead animal matters are regulated; and consequently, that if secretion be an example of chemical affinity, it is so modified by the vital powers, that we can have very little hope of imitating it by experiments out of the body.

In what manner, and to what extent, are the secretions influenced by the nerves? The fact that glands have a supply of nerves, leads us to expect *à priori* that the effects of their operation will be very obvious; but the laws, which regulate this matter, are hitherto by no means clearly ascertained, and even the kind of influence is very obscure. There is a want of direct evidence, from experiment, on this subject. "I divided," says Bichat, "the nerves of the testicle in a dog: the gland inflamed and suppurated; but the latter occurrence shews that nervous influence is not necessary for secretion, since suppuration is accomplished in a manner analogous to that of the latter functions. Physicians know very well that paralysed limbs may inflame and suppurate. Erection and expulsion of the semen may occur, when the lower half of the body is paralysed, and when the nerves of the prostate at least must have entirely lost their influence. An example was related to me of a soldier, who contracted a gonorrhœa in this state. In complete paralysis of the bladder, mucus is still secreted in sufficient abundance. The nostril of the affected side is as moist as usual in hemiplegia; and an equal quantity of cerumen is produced in the meatus auditorius of the same side. The glands of the uvula

do not cease to act where that organ is paralysed. After cutting the nerve of the eighth pair on one side in a dog, the air-vessels are equally full of mucus on that side. In the convulsed state of such parts as possess glands, where the nerves of these organs must consequently be unusually excited, there is no augmentation of the secretion." *Anatomie Generale*, tom. 4. p. 604. We may observe further, that when the influence of the brain on the organs of the animal life is completely suspended in apoplexy or compression, where sensation and voluntary motion are lost, the secretions continue undisturbed. On the other side we may adduce numerous phenomena, which can be accounted for only through the agency of the nervous system. Under this head we may mention the flow of saliva on the sight of food, the increased lacrymal secretion produced by various affections of the mind, the suppressed discharge from the skin from the same cause. The urinary secretion is often suddenly affected in hypochondriacal persons; distressing news will occasion it to be secreted in great abundance, and on a very pale colour; and many remarkable instances have been recorded, where the biliary secretion has been decidedly and suddenly affected by mental emotions. It has been asserted, but we know not on what authority, that a cow, after being milked by the same individual for a long time, will give much less milk, if the operation be performed by a stranger. These and other analogous facts have led many physiologists to admit of a nervous influence in the affair of secretion; the mode and degree of this action have been variously estimated. De Berger conceives that the tone of the secretory organs was kept up by the nervous fluid; *De Natura Humana*, p. 122. Quesnay referred the differences of the secreted fluids to various degrees of sensibility in the secretory vessels; *Essais sur l'Econ. Anim.* t. 3. p. 437. De Bordeu ascribed great influence to the nerves on the secreting arteries; *Recherches sur les Glandes*, p. 352. Stahl and his followers, who ascribed the power of guiding the vital motions to the soul (*anima*), conceived that it governed the business of secretion also; and A. F. Hoffman ascribes the difference of the fluids entirely to the *anima*, which regulates the secretory orifices by sphincters and valves, now closing them to prevent the entrance of particles heterogeneous to the fluid intended to be formed, and now opening them for the entrance of the suitable molecules; *Nov. Hypothes. Physiolog.* p. 13. After recounting these opinions, Haller observes that they ascribe too great an influence to the nerves, and reminds his reader that secretions of various kinds are performed in plants, without the assistance of nerves; and that balsams, resins, gums, and coloured milky fluid is formed from the common liquor taken in by the roots of the vegetable. On this subject we may observe, with Bichat, that the expression *nervous influence* has generally been used by physiologists in a very indefinite manner. When the irritation, division, or paralysis of a nerve supplying a voluntary organ interrupt or entirely destroy its functions, we can observe and appreciate the influence of the nerves on such organs; but, with what propriety can we employ the same term to designate the power, which the nerves may possibly have over the secretory organs, when their division or paralysis does not at all disturb the functions of the part?

The secretions may be affected by the direct action of external irritants, although mechanical or chemical irritation in the living body produces no sensible motion or contraction of the organ. Thus, any acid matter will augment the flow of mucus from those surfaces which secrete it; and the slightest irritation of the conjunctiva increases the secretion

of the lachrymal gland. The presence of food in the mouth excites the salivary organs; and the act of suckling or milking produces a secretion of milk, &c. &c.

The same powers by which secretion is effected accomplish the passage of the fluid, when produced, through its excretory tubes; it is the insensible organic contractility by which this is effected. Experiments on the ducts of glands in living animals, show that they are not affected by chemical or mechanical irritation, and hence many have concluded that they possess no power of contraction; but the phenomena render it necessary to allow them such a property, which may exist in parts, although the trials just mentioned should not render it obvious. External pressures and extraneous influence of other kinds have been resorted to, in order to account for the expulsion of the fluids contained in excretory tubes, on the idea that these canals possessed no contractile powers in themselves. Such explanations are quite gratuitous assumptions in all cases; and in many instances are totally and manifestly inadequate, because the organ is exposed to no agency of the kind.

The secreted fluid in some instances is not conveyed immediately to the point of its ultimate destination; but is either retained in the excretory tubes, or kept in particular reservoirs; and it has been supposed that various changes take place in its nature and properties under these circumstances. "Frequentissime," says Haller, "hoc mechanismo natura utitur, ut humorem secretum retineat, perficiat, inspisset, ad destinatus usus contemperet, legitima occasione effundat." *Elem. Physiol.* t. ii. p. 445. The urinary and gall-bladders are the most remarkable instances of this description: we may mention also the vesiculae feminales, and the mucous ducts of the urethra and female organs of generation. That the secreted fluids in these, and in several other instances, are considerably altered after the time of their first production, cannot admit of a doubt, as mere inspection is sufficient to prove it; the particular changes produced in each case will be considered in the account of the various organs. The opinions entertained concerning the general effects of these reservoirs, are, that the fluids are inspissated by an absorption of these aqueous parts, that they are depurated, or rendered more perfect, and variously mixed together: it is added, that their retention in the heat of the living animal body in many instances renders them acrimonious, and that this change, in many cases, as in the bile and semen, promotes the views of nature. These notions are not very consistent with each other, nor very clear in themselves: the latter supposition, concerning the acrimonious tendency of the fluids, is founded on the observation of the changes occurring out of the body, and is not at all warranted by observation of the living subject, in which chemical alterations are resisted by the vital powers.

We have every reason to suppose that much of the secreted fluids is taken up and carried into the circulation by the absorbents; but our knowledge does not enable us to determine the exact extent or nature of the modification, which the function of secretion undergoes from this cause. The experiments of Bichat prove that the various animal products, even those which we should at first have regarded as the most noxious, may be introduced into the venous system without essential injury to the animal; so that the blood may be deemed a common fluid, receiving and retaining various principles, which may vary according to circumstances. "I injected," says Bichat, "into the jugular veins of several dogs, cystic bile taken from other dogs opened at the same time. During the first days they appeared weary, did not eat, were very thirsty, had a dull look about the

eyes, and were constantly lying down; in a little time, however, they gradually recovered their original vigour. I have since employed human bile in similar experiments: the results were the same, except that hicough and vomiting took place soon after the experiment. In one instance the animal died three hours after the injection; here I had used bile of an extremely deep black colour, like thick ink, such as is occasionally seen in the gall-bladder, and seems to form an essential part of the black vomitings observed in certain cases. When similar trials were made with saliva, the consequent languor was less sensible. I then tried mucus of the nose suspended in water. Lastly urine itself, not of the aqueous kind, but that of coction, was employed; the consequent illness was more severe, but one animal only died, and I suspect that this fatal event happened from the unguarded introduction of a little air at the time of the experiment." *Anatomic Generale*, t. 4. p. 587. He observes afterwards that the injection of any animal fluids into the carotid artery is immediately fatal, from the effects produced on the brain: but they may be thrown with impunity into other parts of the arterial system, as, for instance, into the crural artery.

*Sympathies of the glandular system*—These may be divided into the passive and active. The glandular tissue is very readily influenced by various excitations, either in the natural state, or in diseases, which constitute its passive sympathies. The cases in which the excitation of other organs augments glandular action, are particularly observable in the mucous system. Most of the excretory ducts open on surfaces of this nature; and examples of the observation occur in the flow of saliva determined by the presence of food in the mouth; in that of urine produced by catheters retained in the bladder; in the seminal excretion produced by irritation of the glans; the flow of tears from irritation of the conjunctiva or pituitary membrane; and in that of bile during the passage of the food into the small intestine.

The glandular system frequently exhibits passive sympathies in disease; the organic properties are brought into action under these circumstances, the animal sensibility being very seldom developed so as to produce pain. The innumerable varieties in the quantity or quality of fluids separated by the glands under circumstances of disease arise principally from sympathetic influence. Thus the salivary apparatus moistens the mouth, or leaves it dry; fills it with a viscid or a thin fluid, &c. The mucous organs cover the tongue with matters of most varying consistence, thickness, and colour; and this occurs from sympathy with various states of the stomach. The liver, kidney, and pancreas are influenced in very numerous ways; wherever any organ in the animal economy is affected, these are deranged; their secretion is increased, diminished, or altered, and frequently even inflammation and suppuration supervene. The affections of the liver from injuries of the head are well known; and the lachrymal secretion is variously modified in inflammatory and malignant fevers, so as to produce various appearances of the eyes. Weeping in various mental affections is another example of sympathetic influence. The testicles and prostate exhibit fewer instances of such sympathies, probably because their functions are so much more isolated. The relations which connect the breasts and uterus are remarkable, and frequently observed. In the sequel of considerable acute diseases, particularly fevers, the action of the glands is often considerably affected, and copious evacuations, called critical, the nature of which is not yet clearly explained, take place.

The active sympathies are less frequent than those of the



preceding class; but diseases exhibit instances of them. Inflammations of the liver, kidney, salivary system, &c. shew various phenomena produced sympathetically in other systems.

Bichat, in his *Anatomic Generale*, gives the following view of the characters which distinguish the vital properties of the glandular system.

1st. *Peculiar vitality (vita propria) of each gland*—The vitality of the glands, resulting from the preceding powers considered in a state of action, is not uniform in the whole system; because the structure varies in every instance, and each tissue possesses a peculiar modification of vitality. Hence result many phenomena noticed by Borden.

1. There are certain matters on which alone each gland can act in the natural state. Thus the salivary apparatus does not form bile, the liver does not separate urine, &c.; and on this principle the difference of the secretions is founded. In the same way cantharides act particularly on the urinary organs; mercury on the salivary glands, &c. 2. Each gland has its particular mode of sympathy. Thus the liver acts especially on the brain, the kidney influences the stomach, the uterus and breasts affect each other, &c. 3. Each glandular inflammation has a peculiar character: that of the kidney is different from that of the liver or testicle; the inflamed prostate has very different symptoms from the testis in such a condition. 4. Every gland has peculiar diseases, or some at least to which it is more exposed than others. Hydatids, which are very common in the liver, are never seen in the salivary glands or testicle. Sarcocoele is extremely common, while nothing is more unfrequent than an enlarged parotid. The liver alone exhibits that peculiar alteration, which constitutes the fatty state; and is the most frequent seat of steatomatous tumours. Physicians, who have not been conversant with the inspection of morbid cases, use the vague and insignificant terms of obstruction and induration for every kind of glandular enlargement. The increase of size is the only common character of such affections, while the nature of the tumour is entirely different. 5. Every gland presents some peculiar modifications in what are called the critical evacuations, occasionally consequent on acute diseases. 6. The different vitality of the glands occasions them to re-act at very different intervals, in consequence of direct irritation, or sympathetic excitation. The lacrymal gland, for example, pours out suddenly an abundant secretion, when irritated; while the kidneys or pancreas can be excited only very slowly.

2d *Character. Inactive state of the vital powers*.—The glands are subject to habitual alternations of increased and diminished action. The animal functions are especially influenced by sleep, which completely suspends them. The action of the glands is only partially diminished at certain times, except in disease, when it is sometimes completely suspended. Bichat compares the sleep of the animal life to the intervals of intermittent fevers, where the apyrexia is complete: and the sleep of the glands to those of remittent fevers, where the symptoms are merely diminished in degree. Saliva flows into the mouth abundantly during mastication; it merely moistens the cavity at other times. The pancreas and liver pour out their secretions profusely, while the food is in the duodenum: they act much less intensely during the state of abstinence. The kidney is particularly exerted some little time after a meal. The intermissions in the action of the breasts are almost as complete as those of the organs of animal life. Every mucous gland has its particular period of secretion; it is, when the surface, on which the duct opens, is in contact with any substance either retained in the cavity, or passing through it. We must, therefore, form

this notion of the office of the glands; that they constantly separate a fluid from the blood, but that they are more active at certain periods, and consequently furnish a more abundant supply.

This remittance of the glandular action, says Bichat, depends on a cause analogous to that of sleep, which arises, in the animal life, from the fatigue experienced by the organs of sensation and locomotion, after a continuance of action. The lassitude, of which the glands are susceptible, is not generally marked by any painful feeling; yet there is in the breast, after long suckling, a kind of dragging sensation, and actual pain is felt in the testis after emission has been repeated two or three times.

3d *Character*.—The vitality of the glands is never increased at the same time in the whole system. When one is in action, the others are in a state of remission. We might conceive, says Bichat, that there is only a determinate quantity of vital powers for the whole, and that one cannot be exerted unusually without a corresponding diminution in the rest. The digestive apparatus is accommodated to this law. At first the salivary system produces an abundant secretion; then the stomach comes into action; thirdly, when the chyme enters the duodenum, the liver and pancreas are principally exerted; at the fourth period, the mucous glands of the large intestine act; and lastly, the kidney exercises its peculiar office to evacuate the residue of the fluids. All the glands cannot act at once; as, in the external movements, certain muscles are always in a condition of repose, while others are contracted. The most improper time for coition is during digestion, because the mucous, pancreatic, hepatic secretions, &c. must then be performed at the same time with that of the testicle. In diseases, the secretion of one gland is increased at the expence of others. This character of the glandular system is only an example of the general character belonging to all the vital powers, by which, when increased at one point, they are proportionally diminished in some other situation. Hence large abscesses, considerable tumours, and dropsies are always attended with debility of the glandular action. On the same principle is founded the use of blisters, setons, moxa, cauteries, &c. which do not act, as old physicians supposed, by evacuating any morbid matters, but by putting an end to the irritation in the diseased part, by means of that which they determine in some other organ.

4th *Character*.—Influence of climate and the seasons on the vitality of the glands. From the preceding character is derived another phenomenon, which may be considered peculiar to the glandular system; viz. that it is in general more active in winter than in summer, in cold than in warm climates. Warmth, by relaxing the integuments, increases the cutaneous discharge at the expence of that of the glands; while the action of cold is the reverse of the preceding. Hence the same fluid, introduced into the body, is expelled in summer by the skin, in winter by the kidneys.

5th *Character*.—Influence of sex on the vital properties of the glands. Is the vitality of these organs more active in the male than in the female? In those which are subservient to digestion, the lacrymal and urinary secretion, &c. the two sexes exhibit very little difference. In the generative system, the male possesses the addition of testicles and prostate, the female of mammary glands; so that here there is a compensation. But the influence of the former on the animal economy very much exceeds in its force that of the latter.

#### *Development of the Glandular System.*

1. *State of this system in the fetus*—Although the secre-

tions possess very little activity in the fœtus, the glands in general are large. The salivary glands and pancreas are larger than in the sequel: the bulk of the liver is enormous; and the kidneys considerably exceed their adult volume. It is not yet ascertained whether the same observation applies to the mucous glands. The form and colour are different in several from what they afterwards exhibit. The texture partakes of that softness and delicacy, which are common to the whole body; and they abound with fluids. In respect of their secretions, they seem to be in a condition analogous to that of remission in the adult: indeed, they produce still less than at that time. In fact, all the reservoirs would not suffice to contain the produce of their secretion, if these were as much produced in a given time, as after birth. Is this because the black blood, which they contain, does not furnish suitable materials? or rather, because the actions concerned in the composition of the body predominate so remarkably over those of the other kind? All the matter brought to the organs remains in them, and affords the materials of the rapid growth, which is then taking place: consequently, the secretions, which are designed chiefly to get rid of the residue of nutrition, are then inactive. Moreover, digestion introduces into the blood none of those principles, which, not being required for nutrition, are expelled nearly as they enter, without having belonged to the composition of the organs; such as the greatest part of the drunk.

2. *State of the glands during growth.*—This system acquires a sudden increase of energy at the time of birth. Red blood now circulates through its vessels; and the extremities of the excretories are stimulated in various ways, as, by the food in the case of those which open on the alimentary canal, by the air in the respiratory apparatus, &c. The organs are so much the more sensible to this sudden excitation, in proportion as they were before unaccustomed to it. Yet many of the secretions are carried on with less activity during the first years of life, than in the sequel, as those of the salivary glands, liver, &c. Affections of the glandular system are not the leading ones in the first years of life. The lymphatic glands, as they are called, and not the parotids, form the swellings so frequent about the neck. Hepatic affections are rare at this time. All the secretions connected with the generative process hitherto do not exist. The organs, which are particularly employed at any age, are chiefly affected by acute and chronic diseases at that time; while those, by which no important function is exercised, seem to be overlooked. All affections of the testis and chord are infrequent before puberty, while the process of nutrition alone is carried on in these organs. The glandular tissue is for a long time soft and delicate in the child; and it has not that property of becoming hard in consequence of boiling, which we have mentioned as belonging to it in the adult.

3. *State of the system after growth.*—We have already spoken, in the article GENERATION, of the organs which come into activity at puberty, and of the influence which they exert on the frame. At this time all the system acquires a greater firmness in its texture. Towards the fortieth year the digestive glands seem to be predominant in the economy, and the liver is especially observable among those. Now bilious affections are most numerous; and the influence of those passions, to which the bilious temperament seems to dispose, is most observable.

4. *State of the glands in old age.*—At this time the organs gradually become more hard in their texture: but their colour changes less than that of most parts. The liver, kidney, &c. are nearly as full of blood as in the adult;

while the muscles, pale and colourless, contain a smaller proportion than before. It seems that this fluid first quits the skin and muscles, which are farthest from the heart, and is concentrated in the nearer organs: thus the secretions are still abundant in old persons, while the muscular and nervous powers are considerably weakened. The kidneys and liver still separate their particular secretions in large quantity. The activity of the generative system has long ceased. The active exertion of the glands which are still employed may be referred to two causes. The decomposition of the body is very marked at this time, and much matter is consequently thrown out by certain glands. The decay of the old subject is a phenomenon exactly opposite to that of growth in the fœtus. The skin, shrivelled and hardened, ceases to throw out the products of decomposition, and the glands supply its place.

Generally speaking, life ceases most gradually in the glandular system. In the bodies of old persons we see the gall and the urinary bladders still full of their respective fluids. Compression of any gland, even of the prostate, shews that it contains much fluid; even more than we observe in the young subject. It is also a remarkable phenomenon that all the chief internal organs, as the liver, kidney, heart, lungs, &c. still preserve a considerable share of vitality, while the parts subservient to sensation and locomotion are nearly exhausted, and the ties, which connect the individual to surrounding objects, are consequently nearly destroyed. Haller, *Element. Physiolog.* tom. 2. Dumas, *Principes de Physiologie*, t. 4. Bichat, *Anatomie Generale*, t. 4.

GLAND, in *Vegetable Physiology*, (*glandula*, a little kernel,) is defined by Linnaeus as “a small tumour, discharging a fluid.” This fluid is always some peculiar secretion. The calyx and stalks of the Moss Rose, and of many other Roses in some degree, are covered with prominent glands, discharging a viscid aromatic liquor. Between the serratures of the leaf of *Salix pentandra*, the Bay-leaved Willow, is a series of such glands, whose exudation is a highly fragrant yellow gum-resin, to which the fine-scent of that leaf is chiefly owing, and several other Willows are provided with similar, though less perfumed, secretions. On the footstalks of the Guelder-rose, *Vitarnum Opulus*, are very large and elaborate glands, whose discharge however is comparatively trifling, while various species of Passion-flower bear cup-shaped glands, on their footstalks, producing a considerable quantity of very sweet honey. These therefore bear more analogy to those glands, appropriated to some flowers, and called, from their produce, nectariferous glands, or nectaries. Such occur in *Geranium*, and in the Cruciform plants, constituting the Linnæan class *Tetradynamia*. In the latter the nectariferous glands occasionally exhale a powerful scent, especially in *Sisymbrium tenuifolium*, Engl. Bot. t. 525.

The kinds of glands above-mentioned, being of a secretory nature, certainly bear a great analogy to the glands of the animal body, but it appears that the more general and important secretions of vegetables are accomplished through membranes, whose organization and physiology are inscrutable to our powers of investigation. S.

GLANDS, *Diseased*. See BUBO, LUES VENEREA, SCROFULA, BRONCHOCELE, &c.

GLANDS of Birds and Fishes.—See *Anatomy of BIRDS*, and FISH.

GLANDEN, in *Geography*, a town of Prussia, in Nantangen; 30 miles E. of Brandenburg.

GLANDERS, in *Veterinary Science*, a filthy disease in a horse, so called, probably, from the swelling of the submaxillary glands that accompanies it; and consisting in a corrupt

## GLANDERS.

corrupt stinky matter, running from the nose, of a different colour, according to the degree of the malignity, or as the infection has been of a shorter or longer continuance; being white, yellow, green, or black, sometimes tinged with blood.

Authors ascribe it to various causes: some to infection; some to a disorder of the lungs; others to the spleen; some to the liver; and others to the brain. After it has been of so long standing, that the matter is of a blackish colour, which is usually in its last stage, they suppose it to come from the spine; and hence they call it the *morning of the chin*.

Kernels and knots are usually felt under the caul in this disorder; and as these grow bigger and more inflamed, so the glanders increase more. The progress of the disease is extremely uncertain; as some horses will endure it for many years, without any other obvious inconvenience than a slight discharge and the enlargement of the glands under the jaws; and instances have occurred in which these symptoms have disappeared for several weeks, and returned, perhaps, with no augmented virulence. In most cases, however, the course of the malady is more rapid; the bones and cartilages of the nose are speedily eroded by the malignity of the ulcers, from which an absorption commences, and conveys the poison into the circulation, gradually and fatally contaminating the whole frame. Neither the appetite nor the condition of the glandered horse suffers materially in the early or mild stage of the complaint. When, however, it has spread its dominion over the thoracic viscera, forming ulcers in the substance of the lungs and in the wind-pipe, great pain and difficulty of respiration are experienced, the discharge becomes very considerable, the appetite is injured, and the body of the unfortunate animal exhibits a picture of extreme distress; and unless the humanity of the owner does not induce him to terminate his sufferings, the disease will, by tardy steps, afford relief to the wretched animal by dissolution.

M. La Fosse, farrier to the king of France, has taken great pains, by repeated dissections, to discover the source and cause of this disorder, and to ascertain the proper and effectual method of cure. He has distinguished seven different kind of glanders, four of which are incurable. The first proceeds from ulcerated lungs, the purulent matter of which comes up the trachea, and is discharged through the nostrils, like a whitish liquor, appearing sometimes in lumps and grumes; the second is a wasting humour, that usually seizes horses at the decline of a disease caused by too hard labour, and proceeds from the lungs; the third is a malignant discharge, which sometimes attends the strangles, falls upon the lungs, and is discharged at the nostrils; the fourth is when an acrimonious humour in the face seizes these parts; the fifth arises from a horse's taking cold; the sixth is a discharge from the strangles, which sometimes vents itself at the nostrils; the seventh, or real glanders, is that above described.

M. La Fosse, after examining, by dissection, the carcases of glandered horses, and making a strict scrutiny into the state of the viscera, assisted in his enquiry by ingenious anatomists for the space of ten years, affirms this disease to be altogether local, and that the true seat of it is in the pituitary membrane which lines the partition along the inside of the nose, the maxillary sinusses or cavities of the cheek-bones on each side of the nose, and the frontal sinusses or cavities above the orbits of the eyes; that the viscera, as the liver, lungs, &c. of glandered horses are, in general, very sound; and, therefore, that the seat of the

disorder is not in those parts, as many authors have asserted.

He found these cavities more or less filled with a viscid stinky matter: the membrane, which lines both them and the nostrils, inflamed, thickened, and corroded with fordid ulcers, which, in some cases, had run into the bones. He observes, that, when glandered horses discharge matter from both nostrils, both sides of the membrane and cavities were affected; but when they ran at one nostril only, that side only was found diseased; and if one gland only was affected the horse discharged from one nostril only; but if both were affected, the discharge was from both. It has been observed, that the glanders in horses very much resembles a disorder in men, called *ozena*.

In this disease, if the matter sticks to the inside of the nostrils, like glue or stiff paste; if the inside of the nose is raw, and appears of a livid or leaden hue, and the matter becomes bloody, fetid, and of an ash-colour; these symptoms are very unfavourable; but when only a limpid fluid is first discharged, and afterwards a whitish matter, the gland under the jaw does not much increase, and the disorder has been of no long continuance, a speedy cure may be expected. The cure of the milder kind of glanders may first be attempted by injections and fumigations. When these latter symptoms appear, the horse should first be bled, and treated as in the common disorder of cold; and then let an emollient injection, prepared with a decoction of linseed, marsh-mallows, elder, chamomile flowers, and honey of roses, or such like, be thrown up as far as possible with a strong syringe, and repeated three times a day: if the running is not lessened or removed in a fortnight by these means, a restraining injection may be prepared with tincture of roses, lime-water, &c. and the nostrils fumigated with the powders of frankincense, mastic, amber, and cinnabar, burnt on an iron heated for that purpose, the fumes of which may easily be conveyed through a tube into the nostrils. When the disease is inveterate, recourse must be had to the operation of trepanning, which M. La Fosse performed on three horses, two of which discharged from one nostril only, and the third from both; he trepanned the two first on that side of the head which was affected, and the other on both sides, and found that the wound and perforation filled up with good flesh in twenty-six days, and the horses suffered no inconvenience from the operation. The method of performing this operation will be understood by means of *Plat. XIX. Mistletoe, fig. 1*, and the following explication: B, B, are two lines representing the bounds of the cerebellum, or back part of the brain, which commences from the line D. C C is a line, where the superior part of the sinus frontals commences, together with a view of the bottom of the sinus, terminating between the lines D and E, where appears a substance in the form of a pear, which is the os ethmoides, or sieve-like bone through which the olfactory nerves pass, communicating sensibility to the pituitary membrane. E represents the beginning of the maxillary sinus, terminating at M: the shaded space between these lines represents the great cavities. F is a bony partition, separating this sinus into two parts that have no communication: of which partitions there are sometimes two, represented by F and G. Some horses have neither of these. N shews the place of the cornets or horns; O, the redoubling; P, their middle part; Q, the lower part of them; and M, the bony pipe or canal which guards the maxillary nerve: A A is the septum narium, dividing the nose from top to bottom, and separating the two nostrils; L shews the place where the trepan should be applied, when there is reason to apprehend that the glanders is spread into the frontal sinus; E is the place where it should be applied

to cleanse the maxillary sinus, though the round spot between D and E is preferable, because one orifice in this place will serve to wash all the parts, both above and below, with one injection. H shews the place where another perforation should be made, as a drain for discharging the foul matter washed away by the injection; and this hole, kept open by a hollow leaden pipe, would, in all recent cases, be sufficient. I represents the injection thrown in by the syringe, which flows out by the orifice and the nostril K; and, during this part of the operation, the nostrils should be held close. If there should be two holes in the maxillary sinus, it is absolutely necessary to pierce through both, with a siketto or sharp-pointed tuck, as in the figure. The trepan should be directed towards the interior part of the nose, to prevent its being obstructed by the roots of the teeth. R is the trepan, S the handle which turns it, and T the saw-part to be applied to the bone. The surgeon's trephine will answer the purpose for this operation; but before the instrument is applied, a circular piece of the skin, of about the size of half a crown, should be first cut off with the membrane which covers the bone. The syringe should be large enough to contain half a pint of injection. The injection first used should be of a detergent nature, as a decoction of birth-wort, gentian, and centaury, to a quart of which may be added two ounces of Egyptiacum and tincture of myrrh; and when the discharge abates, and the matter becomes of a thick consistence and white colour, this injection may be changed for barley-water, honey of roses, and tincture of myrrh; and for completing the cure, Bates's alum-water, or a solution of colcothar, vitriol, lapis medicamentosus, and such like, in lime-water, will serve to dry up the moisture, and to restore the tone of the relaxed glands. For this purpose Dr. Bracken recommends the following mixture: Take of alum and white vitriol powdered, of each four ounces; calcine them in a crucible; when cold, powder the calx, and mix it with a gallon of lime-water and a quart of vinegar, and decant the mixture clear for use. The perforations that are made in this operation should be kept open, after the use of the injection, by fitting to the upper one a piece of cork waxed over, and a hollow leaden tent to the lower, through which there will be a constant drain of matter from the sinuses; and both may be secured by a proper bandage. The growth of the flesh should be also checked by rubbing with caustic medicines, or applying the actual cautery. The cure will be expedited, by giving every day a quart or three pints of a strong decoction of guaiacum chips, by purging at proper intervals, and putting a rowel into the horse's chest; and if these fail, mercurials may be administered with the physic, and the alterative powders with lime-water may be given and continued for some time.

The following remedy is said to have succeeded, in fifty cases out of sixty, for curing the glanders, without trepanning. Keep the horse a day or two with small quantities of choice hay, and scalded bran; then blow up his nostrils as much as farabacca, in fine powder, as will lie on a six-pence, evening and morning, giving him for drink small linseed-water, during four or five days; then boil two ounces of elecampane roots in a quart of drink, till they mix, and give it once a day during three or four days more; then boil two handfuls of the white moss that grows on oaken pales, in two quarts of milk, till one is consumed; strain it and squeeze the moss, and give the milk just warm: repeat this for four or five days. About an hour after the horse has had his drink each day, take a piece of sweet butter, about the size of an egg, and about half an ounce of brimstone finely powdered, and work them well together; then take two clean goose feathers, as long as they can be procured, and make a

hole in each of the quill ends; in which fasten two long threads; then anoint the feathers well with the mixture, and roll them in dry flour of brimstone: open the horse's nostrils, and thrust the feathers up into his head, fastening the threads to the top of his head, to prevent their dropping out: ride him an hour or two morning and evening, and let him stand half an hour after he returns to the stable before the feathers are taken out: pursue this course eight or nine days, bathing his head with camphorated spirits of wine, and afterwards confining his head over a tub of hot grains, that he may breathe the steam. A rowel may prevent a relapse.

After all that has been said, it is now generally allowed, that no effectual remedy for the glanders has yet been discovered. The operation of trepanning has never been attended with permanent success; and whatever relief has been obtained from the use of various medicines, it has been merely temporary, and the disease has been pronounced incurable. But though all attempts for curing the glanders have hitherto proved ineffectual, the inquiry should be pursued, and efforts for this purpose should be renewed till the veterinarian's ingenuity and perseverance are crowned with success. The analogy subsisting between the glanders and the venereal disease has led some practitioners to recur to the use of mercury, but the success attending it has been very partial. Professor Coleman mentions a single case which occurred at the Veterinary College, in which the glanders yielded to the treatment employed, which was that of repeated and long continued doses of calomel, carried to the extent of salivation. This solitary case led to many trials of a similar nature, but, unhappily, without the success which was hoped for by the professor, who exerted his wonted ingenuity to improve the hint which this single instance afforded. Others have made similar efforts in this way, with only a temporary abatement of the symptoms, but without ultimate success. Some years ago, great expectations were formed, from the use of the mineral acids in the venereal disease; and trials were made with these in some cases of glanders, which were ineffectual. The late professor of the Veterinary College, M. St. Bel, made a variety of experiments for ascertaining the nature of this disease, and for investigating an effectual remedy, whilst he was professor of the veterinary school at Lyons; he has recorded the cases that fell under his notice, with his method of treatment, which was very diversified and multifarious; but he concludes with observing, "notwithstanding my failures, I think that a remedy may be found for the glanders." Many circumstances convinced M. St. Bel, that the virus of the glanders has greater activity in southern than in northern countries; and that its progress is more rapid in the mule and the ass, than in the horse; but that the former are not so subject to receive it by infection or contact as the horse is. The use of verdigris having been recommended by a professor of the veterinary art, Mr. Lawson, surgeon to the Oxfordshire light dragoons, gave this medicine a trial in two cases, those of a horse and mare, beginning with one drachm daily, and gradually increasing it to one ounce. But no beneficial effect was produced. Dissection of the horse after three months' trial shewed no disease in the brain, but it was altogether confined to the septum of the nose and nostrils.

As the glanders is a disease of such virulence, known to be contagious in a high degree, and hitherto found to be incurable, it is of importance to distinguish it from other diseases to which the horse is subject. A cold, which has been sometimes mistaken for the glanders, may be easily distinguished from them. In colds, there is generally a certain

certain degree of fever, the eyes appear dull or watery, the appetite is diminished, and there is almost always a cough. If the glands of the throat should swell, they are not so closely attached to the jaw-bone as in the glanders, but feel loose and moveable under the skin; they are also generally in a state of active inflammation, feeling hot, and softer than in the glanders. In colds, both nostrils are almost always affected; in the glanders it frequently happens that the discharge is only from one. In colds, the nostrils are not ulcerated; in glanders this always happens, though at different periods of the disease. The strangles have been sometimes mistaken for the glanders; but in this disease the inflamed glands very soon suppurate and burst, by which all the other symptoms are generally removed, whilst in the glanders the glands seldom or never suppurate. In order, however, to avoid all danger, it is advisable, as soon as a horse is perceived to have a discharge from his nose, to put him into a stable, where he can have no communication with other horses. If the glands of the throat be enlarged and inflamed, apply a large poultice to them. Clean the head three or four times a day. Let the horse be well clothed, and give a fever powder every day, or once in 12 hours. By these means, the disease, if it arise from a cold, will soon be removed. When considerable ulceration is perceived in the nose, with the other concomitant symptoms of the glanders, the sooner the horse is destroyed, the better.

The most effectual method of purifying stables in which glandered horses have been kept, is to remove, or carefully scrape, and afterwards scour with soap, sand, and boiling water, every thing on which the horse may have deposited any matter, and afterward to cover every part of the stable with a thick coat of lime and fire. It is a common practice with the owners of horses, when they have had any one of them seized with the glanders, to bleed and purge the rest, by way of prevention; but this method will serve rather to promote than prevent the disease, as it will considerably increase the action of the absorbent vessels, by which action the glanders are conveyed into the system.

**GLANDIUM**, in *Surgery*, a name sometimes given to an excrescence near the anus.

**GLANDORE**, in *Geography*, a harbour of the south of Ireland, in the county of Cork: it is a little to the west of Ross, and has the village of Myros at the extremity of it.

**GLANDORP**, MATTHIAS LOTIS, in *Bibliography*, a physician, was born at Cologne in 1595. He studied first at Bremen in Lower Saxony, whence his family originated, and afterwards returned to Cologne, where he commenced his medical pursuits; but, by the advice of his father's friends, he was soon sent to Padua, in order to reap the benefits of studying under the great masters, who at that time were so distinguished in medicine. He attached himself particularly to Fabricius and Spigelius; and he made such great progress in anatomy under the latter, that he was deemed qualified to give public demonstrations. Before returning to Germany, he received the degree of doctor in 1611. He determined to fix himself at Bremen, in which city he had every thing favourable to his views; and his success in practice gained him so much reputation, that he was elevated to the most honourable offices. He was physician to the archbishop, and to the republic, when he died in 1640. He left several works, adorned with plates, which contain many important observations on anatomy. These are, 1. "Speculum Chirurgorum, in quo quid in aequoque vulnere faciendum, quidve omittendum, praeclara parte aëtiæ anatomicæ explicatione, observationibus ad unumquodque vulnus pertinentibus adjectis, conspicitur ac pertractatur."

Bremen, 1612, 8vo. This was republished in 4to 1628, with these two treatises, 2 "Methodus medendi paronychie, cui accedit de casu observationum;" and, 3. "Tractatus de Polyporum, varium affectu gravissimo."—4. "Gazophylacium polyplisium, tonticulorum et fistulorum resectatum;" ibid 1633, 4to.—London 1633, 4to.—He made frequent use of the actual cautery in the treatment of the most common disorder. The whole of Glandorp's works were collected and printed in London, in 4to in the year 1729, under the title of "Opera omnia, nunc simul collecta, et plurimum emendata." This collection includes also four curious tracts on Roman antiquities. Eley Dict Hist.

**GLANDORP**, JENS, a learned philologist, who flourished in the middle of the 16th century, was born at Münster. He studied under Melancthon, and became very distinguished for his critical knowledge. He was elected rector of the college at Hanover, but, upon some dispute, he quitted in 1555, and retiring to Goslar, was followed by most of his scholars. In 1563, he was made professor of history at the university of Marburg. He died in 1564. His works are, "Sylva Carminum Elegiacorum;" "Descriptio Gentis Antonie;" "Familie Julie Gentis;" "Dilecta Sacra et Moralia;" "Annotat. in Jul. Caesaris Comment;" "Annotat. in Ciceronis Epist. famil.;" "Onomasticon Historie Romanae."

**GLANDULA**, in *Anatomy*, the same as gland.

The word is a diminutive of the Latin *glans*, acorn; and is here used on account of some external resemblance between the glands of the body and the fruit of the oak.

**GLANDULA Glandulosa**, among *Surgeons*, is a tumor resembling a gland; soft, single, moveable, with roots, and separate from the adjacent parts.

**GLANDULE**, in *Trichology*, signifies a little gland. Thus the amygdale, or almonds of ears, are by some called glandules.

**GLANDULOUS**, or **GLANDULAR**, something composed of glands, or that abounds with glands.

The breasts are glandulous bodies. The cortical substance of the brain is commonly reputed to be glandulous; though Ruysch, from the discoveries made by his admirable injections, holds, that there is no such thing as a gland therein.

The ancients distinguished a particular kind of flesh, which they called *caro glandulosa*, or glandulous flesh.

**GLANDULOUS Body**, *glandulosum corpus*, more particularly denotes the prostate.

**GLANDULOUS Roots**, among *Botanists*, such tuberosc roots as are fastened together in large numbers by small fibres or threads.

**GLANIS**, in *Ichthyology*, a species of *fluvius*, which see.

**GLANOVENTA**, in *Ancient Geography*, a place of Britain, in the 10th Iter of Antoninus, supposed by Horsley to be Laacheter, in the county of Durham.

**GLANS**, *Acous*, in *Natural History*, a fruit contained within a smooth but hard bark, including a single seed; its hind-part being covered with a kind of cup, and the fore-part bare. See **ACOUS** and **OAK**.

**GLANS Maritima**, a name given to a genus of shell-fish, more usually called *lakanus*, and in English the centre shell.

**GLAN**, *Trochifera*, a name given by Gesner, and some other writers, to a kind of figured fossil, found usually among the trochiteæ and entrochiteæ, and evidently appearing to have in some manner belonged to them. All the writers, who have themselves examined the places where the trochiteæ are found, have mentioned these under the names of glandes trochifera, others under less determinate ones. Agricola

calls them lapides informes; and Lister, after him, rude stones, having impressions of the entrochi. See farther Philof. Transl. N<sup>o</sup> 100.

**GLANS Penis**, in *Anatomy*, the rounded extremity of the organ. See GENERATION, *organs of*.

**GLANSHAMMAR**, in *Geography*, a town of Sweden, in the province of Nericia; seven miles N. E. of Obreo.

**GLANVILL. JOSEPH**, in *Biography*, was born at Plymouth in the year 1636, where he probably received the early parts of his education: but he pursued his maturer studies at Exeter college, Oxford. He took his first degree in the year 1655, and removing to Lincoln college, he graduated master of arts in 1658, and was, about the same time, appointed chaplain to Francis Rous, esq. provost of Eton college. The death of his patron induced him, after a very short time, to return to Lincoln college, where he spent his time in literary and philosophical studies, till the restoration of king Charles II. He became acquainted with the writings of Richard Baxter, and was an ardent admirer of his preaching and religious principles. He is said to have been an eager republican in politics, but, whether this be the real fact, has been much doubted. Upon the re-establishment of monarchy and episcopacy, he conformed to the national church, a circumstance that did not in the least abate the esteem which Baxter had before manifested for him. He became a zealous convert to the principles of the new philosophy, in opposition to the system of Aristotle, and published a work in their justification, entitled "The Vanity of Dogmatizing or Confidence in Opinions," &c. This piece introduced him to the acquaintance of many of the persons who afterwards formed the Royal Society. About this time Mr. Glanvill entered into orders, and was presented to the rectory of Wimbold, in the county of Essex, and in 1662 he was inducted into the vicarage of Frome-Selwood, in Somersetshire. He published in the same year, but anonymously, a discourse on the fundamental doctrine of the ancient eastern philosophers, which he endeavoured to prove was not incompatible with revealed religion. It was entitled "Lux Orientalis: or an Enquiry into the opinion of the Eastern Sages concerning the Pre-existence of Souls; being a Key to unlock the grand Mysteries of Providence in relation to Men's Sin and Misery." Upon the establishment of the Royal Society, he published his former treatise, corrected and enlarged, under the title of "Scepſis Scientifica; or confessed Ignorance in the way of Science, in an Essay on the Vanity of Dogmatizing and confident Opinion." This work was dedicated to the Royal Society, and the author was almost immediately admitted one of its members. In 1666 he published his work, entitled "Some philosophical Considerations touching the being of Witches and Witchcraft." This performance, which is still regarded as a curiosity, though very little creditable to the judgment of the author, engaged Glanvill in a controversy which lasted as long as his life. He was now presented to the rectory of Bath, in which city he fixed his residence. Here he met with many opponents, who were apt to treat him but roughly, on account of his adherence to the new philosophy, which led him to draw up a small but elegant treatise, entitled "Plus Ultra: or the Progress and Advancement of Knowledge since the Days of Aristotle. In an account of some of the most remarkable late improvements of practical useful learning, to encourage philosophical endeavours, &c." The author was violently attacked on this occasion, but he defended himself with spirit and success. His reputation was now firmly fixed, and he was frequently called upon to preach on public occasions. At a visitation of the diocese, he delivered a discourse which met with general approbation, and

which was frequently re-printed: it was a defence of reason in the affairs of religion, against infidelity, scepticism, and fanaticism of all sorts. He next attempted to shew the correspondence between religion and the new philosophy, in a discourse concerning the religious temper and tendency of the experimental philosophy which is professed by the Royal Society. "Whole," says one of his biographers, "he was entitling himself to the particular acknowledgments of the members of that body, by defending the reasonableness and useful tendency of their pursuits, he also contributed to their collection of instructive and entertaining papers, some observations on the mines in the Mendip hills, and on the natural history and springs of Bath, which were well received, and inserted in the Philosophical Transactions." In the year 1672, Mr. Glanvill exchanged his rectory of Frome for that of Street, in the same county, with the chapel of Walton annexed; and about the same time was made one of the king's chaplains. In 1676, he published his "Essays on several important Subjects in Philosophy and Religion," consisting of the principal of his former pieces, revised and improved, with a treatise, entitled "Antifanatic Theology and free Philosophy." Two years after this, his "Essay concerning Preaching" came out; it was written for the purpose of dissuading the younger clergy from that affectation of wit and fine speaking, which began to be fashionable in those times, and to recommend and enforce a plain and practical method of enforcing the moral duties of the gospel, as the true eloquence of the pulpit. The last work of this worthy divine, was entitled "The zealous and impartial Protestant, shewing some great but less heeded Dangers of Popery." Mr. Glanvill died of a fever at the early age of forty-four, and Dr. Horneck published a quarto volume of Discourses, &c. after his death, to which is prefixed an account of the author. As a preacher, Mr. Glanvill was eloquent and pathetic; in private life he was truly amiable and praise-worthy. He was author of various other tracts besides those already noticed, the titles of which are given in the Biographia Britannica. To this work the reader is referred for further particulars.

**GLAREANA**, in *Ornithology*, the name of a bird described by Gesner from the figure, and suspected to be no way different from the spipoletta, a kind of lark, the *ALAUDA campestris*; which see.

**GLAREOLA**, a species of *Tringa*; which see.

**GLAREOLA**, in *Ornithology*, a genus of the Grallæ order, founded on the natural family called by Brisson "Perdrix de Mer," and also Glareola. The character of this genus consists in the bill being strong, short, straight, and turned down or hooked at the tip; nostrils linear, and placed in an oblique position at the base of the bill; gape of the mouth large; feet four-toed, the toes long, slender, and connected at the base by a membrane; tail furcated, and containing twelve feathers. The number of species, according to Gmelin, are three, namely, Austriaca, Sencgalensis, and Navina, the first of which, however, comprises several remote varieties. Linnæus described this as a species of *hirundo*, the second kind is a *tringa* of the same author, and the third, a *gallinula* of Ray.

#### Species.

**AUSTRIACA**. Above grey-brown; collar black; chin and throat white; breast and belly reddish-grey. Gmel. *Hirundo marina*, Aldr. *Hirundo riparia*, Merg. *Pratincola*, Kram. *Gallinula erythropus minor*, Geln. *Perdrix de mer*, Buff. See *swallow of Adrovandus*, Will.

The length of this bird is nine inches; the bill black, with the base red; upper wing-coverts whitish, quill and tail-



tail-feathers dusky, the outer side of the first tail-feathers white; and the legs and naked part of the thighs in general red. The species inhabits chiefly the fourth of Europe, and the milder parts of Asia; towards the north it becomes more sparingly diffused, and is very rarely seen so remote from the southward as Britain. It abounds most in the plains of the districts towards the Caspian sea, in the neighbourhood of the rivers, its food consisting of aquatic insects and worms.

One of the varieties of this species is called by Brisson *Glaucola torquata*, and by Buffon, "Perdrix de mer a collier." The plumage beneath is white; the front black, with a white spot on each side, and the collar brown. Its feet are rather inferior to the former, and the legs blackish instead of red. This, like the other, is a noisy restless bird, and frequents the banks of rivers, aquatic insects constituting its principal food. The eggs are oblong, and usually about seven in number in each nest.

The bird called "Perdrix de mer" by Sonnerat is another variety of this species: the lower parts of the plumage, and also the rump, are white; and the chin streaked with black, and surrounded by a black curved line. This was caught in the open sea, in the latitude of the Maldivia isles, and lived a month on flies, and bread soaked in water.

Two other varieties occur in the East Indies, on the coast of Coromandel, and are likewise described by Sonnerat; the first of these is brown, the under parts, with the rump and base of the tail white; in the second, the tail-feathers are brown, having the outer ones marked with a white band.

SENEGALENSIS. Entirely fuscous. Gmel. *Glaucola Senegalensis*, Brill. *Tringa fuscus*, Linn. *Perdrix de mer brune*, Buff. *Senegal praticole*. Scarcely exceeds the former in size, being nine inches and a half in length, and inhabits Senegal. The same variety is found also in Siberia.

NEVIA. Brown, spotted with white; lower part of the belly and vent reddish-white, with black spots; bill and legs black. Gmel. *La perdrix de mer tchetic*, Brill. *Gallinula melanopus*, Rottmann, Ray. *Glauc.*, Buff. *Spotted praticole*.

Size of *Glaucola austriaca*. This variety is met with in Germany.

GLARIANUS, HENRICUS, LORITUS, in *Biography*, surnamed *Glarianus*, from the town of Glaris, in Switzerland, where he was born in 1488. He rendered himself famous by his knowledge of music, and belles lettres; but he may more properly be ranked among dilettanti theorists in music, than a musician by profession; and his abilities, as a scholar and critic, have been much less disputed by the learned, than his knowledge of music, by musicians.

He studied at Cologne, Basil, and Paris; his preceptor in music was John Cochleus; and in literature, Erasmus, with whom he lived in strict friendship, and by whom he was warmly recommended, in a letter still extant, to the archbishop of Paris. He is called by Walther a philosopher, mathematician, historian, geographer, theologian, and poet; indeed, he distinguished himself in most of these characters. Gerard Vossius calls him a man of great and universal learning; and for his poetry, the emperor Maximilian I. honoured him with the laurel crown.

His famous treatise on music, is entitled *DOXEPANOPSON*, which includes twelve modes; to which number he wished to augment the ecclesiastical tones, which had never before exceeded eight, from the time of St. Gregory. Zarlino, and a few more, adopted the opinion of Glarianus, but soon relinquished it, on finding that they had made no converts. Indeed, the whole twelve modes of Glarianus contain no other

intervals than those to be found in the key of C and A natural, or in the different species of octaves, in the two boxes; and though his argumentation extends to the various kinds used in the modern style of musical composition, or intervals, as may be seen by his *colloquy*, it is not till us that the authentic modes are D, E, F, G, A, C, and the phrygian, B, C, D, E, G; which are the only ones that A, C, E, G, are repeated, being regarded as the only natural.

His mind of extraordinary capacity, and his sense of the right to liberty, led him to oppose the arbitrary jurisdiction in the state, he was the first who introduced the matter of his tax; but his endeavours were not successful for such a revolution, in the political constitution of the members of the church, to determine of its freedom, that the time which had consecrated, and a authority attached within it, pale.

His *book*, however, cost him many care and labor, and compositions of the greatest nature, of his own, which were excellent studies for his contemporaries, and, if second, would be equally so for his successors, and useful to young contemporaries. Glarianus died 1563, aged 75.

GLARIS, or GLARUS, in *Geography*, a canton in Switzerland, formerly subject to the abbots of the convent of Echternghen, in Suabia, but possessing a democratical form of government, under a mayor, appointed by the electors, but chosen by the inhabitants; till toward the latter end of the thirteenth century, the emperor Rodolph I. obtained the exclusive administration of justice; and soon afterwards he for Albert purchased the majority, which had become hereditary, and reunited in his own person the whole civil and judicial authority. The government of Albert, and of his descendants the dukes of Austria, was arbitrary and oppressive; and therefore, in 1350, Scholtz, assisted by Zoric, Lucerne, Uri, and Unterwalden, expelled the Austrians from the canton of Glarus, and re-established democracy. Glarus then entered into a perpetual alliance with its deliverers, and was received into the Helvetic confederacy, with some restrictions, which were not abolished till 1798. It was then the 6th canton, but afterwards became the 10th rank of the eight ancient cantons, as they were called. The people of Glarus enjoyed their liberties unmolested till 1588, when the Austrians made an irruption into the canton, and pillaged the country and made good the advantages. At this time 350 troops of Glarus, aided by 300 Swissers, repulsed the whole strength of the Austrians, and compelled them to retire. In the 17th century the reformation was introduced into this canton; but the Protestants and Catholics have been accustomed to live together in terms of mutual toleration and friendship; and the industry, industry, and commerce is observed to be far superior to that of the Catholics. The government of this canton, previous to the French violation, was entirely democratical; every person of age of 16 had a vote in the annual general or general assembly, which was annually held in one of the 10 towns; they enacted new laws, and continued to be divided into 10 halves; the church was not independent of the state; the *Landammann* was the chief of the republic, and was elected alternately from the two cities; with the *Landammann* the Protestant remained the chief in office, and the Catholic vice. The other great officers of the board the *Landammann* were taken also by lot from a certain number of candidates proposed by the people. The executive powers were vested in the council of regency, composed of 48 Protestants and 25 Catholics; and each lot had its particular court of justice. The canton comprehends 336 square miles; and its population

estimated at 16,000 persons; its contingent to the army, under the old government, was 400 men. According to the division of Switzerland into 18 departments or cantons, in 1798, the canton of Glarus, together with the bailliages of Wallenstadt, formed the canton of Linth; but according to the constitution of the 29th of May 1801, Glarus, together with the bailliages of Sorgans, Werdenberg, Gullen, Uznac, and Rappenschwell, forms the eighth canton, and deputed five representatives to the diet.

This canton is entirely enclosed by the Alps, except towards the north; and there is no entrance but through this opening, which lies between the lake of Wallenstadt and the mountains separating this canton from that of Schweitz. At this entrance, the canton reaches from the banks of the Linth to the farthest extremity of its Alps, about 30 miles; forming a valley, which becomes narrower as you advance, and is scarcely more than a musket shot in breadth at the burgh of Glarus. It afterwards opens by degrees, and, about a league from this burgh, is divided by the Freyberg mountains; at the point of this division, the two rivers, Linth and Sernft, unite. The hillocks of the Peak in Derbyshire, says Mr. Coxe, are mere mole-hills to the Alps of Glarus. These stupendous chains of rocks are absolutely perpendicular, approach one another so near, and are so high, that the sun may be said to set, even in summer, at four in the afternoon. On each side are a number of waterfalls, which excite attention. The valley terminates in an amphitheatre of mountains, and the glaciers of the canton close the view. (See LINTH.) All the houses in this canton, like those of Appenzel, are built of wood; large, solid and compact, with great pent-house roofs, that hang very low, and extend beyond the area of the foundation. The police in this democratical state is well regulated; nor does liberty often degenerate into licentiousness. Cattle, cheese, and butter constitute the principal commerce of the canton. The cattle are fed in summer upon the Alps; it is computed that 10,000 head of large cattle, and 4000 sheep, are pastured during that season upon the mountains belonging to the canton. The inhabitants also manufacture linen and muslins. Among the exports, a considerable article is slate, with which the canton abounds; the principal quarry being in the valley of Sernft, where large slates are dug up that serve for tables. These quarries once furnished Great Britain with slates for writing; but this branch of trade has been superseded by the great slate quarries in Caernarvenshire. A great part of this canton consists of mountains, rocks, inaccessible forests, and barren heaths, covered with snow; and it is subject to frequent inundations, and to the devastations occasioned by tempests and falling rocks.

GLARNISH, a mountain of Switzerland; 7 miles W.S.W. of Glarus.

GLARUS, or GLARIS, the capital of the above-described canton, situated upon the Linth. The town is large and populous; and the town-house is a handsome structure; 32 miles E. of Lucerne. N. lat. 26 58'. E. long. 9 3.

GLASENDORF, a town of Bohemia, in the circle of Koniggratz; 6 miles N.N.W. of Trautenau.—Alfo, a town of Silesia, in the province of Neisse; 11 miles S.W. of Patshkau.

GLASGOW, a very populous, handsome, and regularly built city, in the county of Lanark, in Scotland; situated on the north bank of the river Clyde, which is navigable for vessels of 100 tons and upwards. In ancient times, and during the prevalence of the Roman Catholic religion, Glasgow was chiefly distinguished as an archiepiscopal see,

and was of course principally under the influence of the archbishop and his inferior clergy. Their power seems in those days to have been civil as well as ecclesiastical, for the charters of the most ancient corporate bodies are held by this tenure, the civil magistrates being only noticed as of subordinate rank and authority, and the freedom fines, and other emoluments are expressly appropriated to ecclesiastical purposes. The revenue of the diocese of Glasgow, if it may be estimated by the extent of lands subject to the payment of tithes, or (as they are called in Scotland) teinds, must have been very great; for those burthens extended over almost the whole of the counties of Lanark, Renfrew, Dumbarton, Ayr, Dumfries, and Galloway, comprehending the whole south-west district of Scotland, and perhaps a moiety of the most fertile land in the whole kingdom. Of this enormous revenue, since the reformation a small part, but now of great value, has been appropriated for the support of the university of Glasgow, some part for the payment of the parochial stipends, and a great part has reverted to the freeholders or their dependants, and these are constantly fluctuating as in other parts of the kingdom. The insurrections and civil wars, which devastated Scotland subsequently to the reformation, and previous to the revolution, having divested Glasgow of all that attraction which it had acquired as the archiepiscopal and occasionally as the royal residence, it appears to have been only remarkable as the occasional scene of those sanguinary and ferocious contests for which the age was conspicuous. It fell into the hands of the regent upon the defeat and flight of the unfortunate Mary Stewart at the battle of Langside, two miles south of the city. It was long afterwards battered and taken by Cromwell's army, and it was the refuge of the defeated party, after the battle of Bothwell bridge, fought between the regent (afterwards James II.) and the Covenanters. After the revolution it seems for many years to have been a place of little importance, possessing neither a sufficient degree of wealth or refinement to render it conspicuous for elegance or luxury, nor such security or strength as to make it desirable or important as a military post. At the time of the Union with England, its whole population was estimated at only 14,000, a fact stated in the house of commons by Mr. secretary Dundas, (now lord Melville,) in one of the debates when the Irish Union was in contemplation. Subsequently to the Union, the rise of Glasgow in commercial importance, even under the successive checks of the two civil wars in 1715 and 1745, of the vastly greater commercial embarrassment, occasioned by the suspension of its colonial trade during the American contests, and all the subsequent hostilities produced by the French revolution, has been perhaps unequalled by any other place in the empire, or perhaps in the world. Its population, under the act of 1794, including its numerous suburbs, was returned at 94,000, and from the concealment which was practised from the idle fears of ignorant people, many of whom foolishly imagined that *casus* to be the precursor of a military conscription, that number is supposed to be at least 30,000 short of the actual amount.

Different histories of Glasgow have been published. Of these, one published many years ago by Mr. M'Ure, one of the city clerks, was much esteemed, but is now considered as obsolete. Others have subsequently been written by Mr. Gibson about 1774, and recently by Mr. Denholm, about 1796.

The limits of this article necessarily preclude the possibility of entering much into detail, nor would it be either amusing or instructive to the general reader. We shall therefore insert what remains concerning the present state of

this great commercial and manufacturing city under the following general heads.

1. *Situation and general state of the adjacent country.*—Glasgow is situated on the north bank of the river Clyde, in N. lat. 55° 52', and W. long. from the meridian of Greenwich 4° 30'. The extreme length from E. to W., including two suburbs, is nearly two miles, and its breadth from the cathedral or high church to the river about one mile. The lower part of the city is nearly level, and the rest is upon the southern declivity of a hill. Perhaps no city or town in Europe is, upon the whole, more regularly planned; for all the principal streets are either parallel or at right angles to each other. The chief streets are better paved than those of London, and generally wider; all the front buildings are of fine free-stone, which is found in great abundance in the immediate neighbourhood. The granite, or *schist stone*, for paving the carriage ways, is also very plentiful close by the town. The houses are very large and lofty, being more generally upon the French plan, where every floor forms a separate lodging, accessible by a common staircase, than upon the English, where one person occupies the whole premises. The more wealthy inhabitants, however, have almost universally adopted the English taste in building. In the old part of the town it is indeed much to be regretted that there are too few public streets, so that an immense number of buildings are crowded together, many of which are accessible only by narrow passages, which are very ill calculated either for free circulation of air, admission of light, or domestic cleanliness. In the modern buildings these inconveniences are avoided, and whatever inconvenience may remain, must rather be attributed to the habits or negligence of the occupants, than to want of facilities on the part of the architects.

There are many very fine public buildings in Glasgow, the most prominent of which we shall very briefly enumerate.

*Churches.*—The cathedral or high church is perhaps the finest specimen in Scotland of that species of architecture, generally denominated Gothic. It was founded in the year 1123, and consecrated in the presence of king David I. in 1136. This building is more similar to that of Litchfield, than to any other of the English cathedrals, but it does not appear to have ever been completely finished, and certainly until lately little care has been used for its preservation. After the reformation it is said to have narrowly escaped destruction from the misguided zeal of the people, who confounded the building itself with the religious or superstitious ceremonies which they had exploded. It now contains two churches adapted to the Presbyterian form of worship, and the choir is used as a place of interment. The burying vaults, or cemetery, were formerly occupied as another place of worship for the barony or country parish of Glasgow; but lately a new church has been erected for this purpose at the opposite extremity of the church-yard. The great spire is very lofty, and in some degree resembles that of Salisbury. The church was dedicated to St. Mungo, or Kentigern, whose burying-place in one of the vaults is still shewn.

The remaining churches possess in general little claim to architectural encomium or description. They are six in number, *viz.* the college, St. Andrew's, North Well, Iron, St. Enoch's, and St. George's.

St. Andrew's church is a handsome modern building, of Corinthian architecture, and is very similar in appearance to the church of St. Martin in the Fields, Westminster.

St. Enoch's and St. George's are also handsome modern buildings. Besides the established or parochial churches, there

are many dissenting chapels and meeting houses, some of which are very handsome and commodious.

*Prison.*—This is a large and very strong building, situated in the centre of the city, adjoining to the Exchange. The lower part is occupied by the council-chambers, and rooms for the magistrates and the city clerks; the middle part of the building contains the close or lock-up rooms for those imprisoned upon criminal charges; and the two upper floors are allotted for the reception of civil debtors. The roofs are lofty, the apartments airy, and the building, upon the whole, commodious; but it is in contemplation to erect a new prison, with an enclosed space round it, where the prisoners may have the benefit of fresh air and exercise, from which they are at present precluded.

*Bridewell.*—This is a large building which serves as a place of confinement, or penitentiary house, for persons of depraved habits convicted of petty offences. It is very well regulated, and every means of encouragement afforded for reclaiming the prisoners from their vices, and promoting habits of industry. Many, at the period of their confinement, have thus acquired and received considerable sums, besides the expence of their subsistence, which is deducted from their earnings.

*Town Hospital.*—for the reception of poor persons unable to maintain themselves. The expence of this establishment is defrayed by a tax or assessment on the inhabitants, and by the proceeds of the labour of those admitted, who are supplied with work suited to their respective abilities. The inmates are aged and infirm persons and destitute children: the latter are well educated, and when arrived at a proper age, the boys are apprenticed to trades and the girls sent to service. The economy of the house is superintended weekly by gentlemen who act in rotation. The whole is very well managed.

*Royal Infirmary.*—a very fine modern building, from a plan of Messrs. Adams'. From 90 to 120 patients are generally under cure, but the house contains accommodation for a much larger number when required. It is supported by donations, legacies, and annual subscriptions; the funds at present amount to 10,000*l.* or 12,000*l.*, besides what has been annually expended; the annual disbursement is about 1800*l.* or 2000*l.*: the direction is vested in the lord provost, the dean of guild, convener of the trades, professors of medicine and anatomy, president of the faculty of physicians, member for the city, and eighteen directors, ten of whom are elected by the contributors, and the others by various public bodies. The directors elected by public bodies are, one by the council, one by the merchants, one by the trades, one by the university, one by the ministers of Glasgow, and three by the faculty of physicians and surgeons. The medical assistance is afforded gratuitously.

*Theatre Royal.*—This superb house was erected a few years ago by voluntary subscriptions, upon transferable shares of 25*l.* each. The total cost was upwards of 15,000*l.* part of which still remains as a debt upon the property, the whole annual rent being appropriated for its gradual liquidation. The direction of the property is in sixteen directors, four of whom go out annually, in rotation, but may be re-elected. It is unquestionably the largest and most magnificent provincial theatre in Britain. The managers are merely lessees, and the lease is always given for a short period, seldom exceeding two or three years.

*Concert and Assembly Rooms.*—These rooms are also very splendid, and, like the theatre, were erected by voluntary subscription, upon transferable shares.

*University.*—The buildings of the university having been erected at various times, and in very different styles, cannot

be appreciated by any precise scale of architectural taste; but the whole has certainly an air of imposing grandeur, and is very well adapted in every respect to the purposes for which it is designed. It consists of four distinct courts, which communicate with each other, and is accessible from the high street by three gate-ways. Behind is a very large garden laid out in grass and shrubbery, with very fine walks; it is divided into three parts, of which one is appropriated as a botanical garden, another is open as a place of exercise and recreation for the students, and the third, in which the astronomical observatory is situated, is generally reserved as a place of retirement, for the professors, or of amusement for their families and friends.

The university of Glasgow was founded in the year 1450, by William Turnbull, bishop of the diocese, and then consisted of a chancellor, a dean of faculty, a principal, who was also professor of theology, and three professors of philosophy.

The professions and lectures are now as follow:  
 A lord chancellor: an office now honorary, and held for life.  
 Lord rector; also honorary—elected annually.  
 Dean of faculties; chosen by the professors or regents.  
 Principal; by the crown—present incumbent, Rev. Dr. Taylor.

Professors.		
Divinity,	-	appointed by the university.
Church history,	-	do. crown.
Oriental languages,	-	do. university
Natural philosophy, or physics,	-	do.
Mathematics,	-	do.
Moral philosophy, or ethics,	-	do.
Logic,	-	do.
Greek,	-	do.
Humanity, or Latin,	-	do.
Civil law,	-	do. crown.
Medicine,	-	do.
Anatomy and botany,	-	do.
Practical astronomy,	-	do.
Lectures.		
Materia medica,	-	do. university.
Chemistry,	-	do.
Midwifery,	-	do.
Natural history,	-	do.
Elocution,	-	do.
Painting and drawing,	-	do.

The funds for the support of the university are in a very flourishing and prosperous state. Independently of the emoluments derived from the students, salaries and commodious houses are allotted to every professor, and these expences are defrayed from the funds at various times granted to the university; of these, the funds or tythes of the parish of Glasgow, form a very prominent part. The students of the five junior classes, *viz.* natural philosophy, moral philosophy, logic, Greek and Latin, are distinguished by wearing gowns of scarlet freeze; the students of the senior classes have no particular distinction of dress. The resident members of the university claim an exemption from all civil burthens and services, and generally from the jurisdiction of the city magistracy, but acknowledge that of the sheriff of the county, and of the supreme courts of Scotland.

The internal government of the university is vested in the principal and professors, who, in their judicial capacity, assume the title of regents. Their supreme court is a general assembly of the whole faculty, who, at a remote period, assumed the power even of capital punishment. The most

severe sentence, however, which has been passed for many years, is that of expulsion, and even this has been very rarely exercised. An inferior court is the "Jurisdictione ordinaria," consisting of at least three regents, who determine offences against the general order and peace of the university, and punish by a pecuniary fine. Each professor also possesses the power of levying small fines in his own class for negligence, contumacy, or irregularity.

The number of students in the university was estimated at 500 thirty years ago, and this number is now greatly increased. The professors and students, when assembled for the election of a rector or any other general purpose, are divided into four nations, according to the places of their respective births, *viz.*

*Glesiani*—comprehending the natives of Clydesdale, and the adjacent districts of Scotland south of the Forth.

*Transforthiani*—the natives of Scotland, on the north of the Forth.

*Rothfiani*—the natives of the west highlands of Scotland and of Ireland.

*Loulaniani*—those of the eastern districts of Scotland, of England, America, and the colonies. The votes of these nations are decided by a majority, and the majority of nations decides the question. In cases of parity the decision is in the regents.

The university of Glasgow has recently received a most valuable acquisition, by the bequest of the museum of the late Dr. William Hunter, of London. For the reception of this valuable legacy, a very handsome building has been erected, where it is now arranged. The museum consists of a valuable collection of paintings, chiefly original; a very fine selection of anatomical preparations; a cabinet of medals, and a fine library. The medals are accounted of such value, that the trustees of the British museum are said to have offered 25,000*l.* for them, besides furnishing such duplicates as they possessed, and defraying the expence of an application to parliament for an act, so far to dissolve the testator's will. This liberal offer, however, was declined.

The public library of the university is also a collection of uncommon value. It consists of upwards of 6000 volumes, and many very rare and valuable manuscripts. In the faculty hall are some valuable paintings, particularly one of the "Martyrdom of St. Catharine."

Among the celebrated literary characters, which have belonged to this seminary, the names of Dr. Cullen, Dr. Adam Smith, and the late professor Miller, are most recently conspicuous.

There are many other public buildings in Glasgow, of which it will be necessary to confine ourselves to very brief notices.

*The Trades-hall*—is a fine modern building from a plan of Messrs. Adams'. It is used for the general meetings of the fourteen incorporated trades, and is also occasionally occupied for concerts, balls, and other public amusements.

*Merchants' Hall*—is an old building, remarkable for nothing but the spire, which is a very fine one. It is used by the body to which it belongs, in the same manner as the Trades-hall.

*Public Markets*.—These are very commodious, and consist of square-paved courts, surrounded by the stalls where the meat is exposed to sale. No cattle are slaughtered here, and they are kept very clean and regularly inspected.

*Barracks*.—These are situated in a large area walled round, and consist of three very large buildings, one of which is appropriated for officers, and two for non-commissioned officers and privates. Their complement is 1072 men, but they will lodge, on emergency, 4 or 500 more.

*Town-House*.—A fine old building adjoining to the prison. Only one hall is retained by the body corporate. The remainder contains the Tontine hotel, which was enlarged by subscription upon lives. The coffee-room is, perhaps, the largest and finest in Europe. It is supported by annual subscription, the subscribers amounting to upwards of 1000, who pay one pound the dollars each.

*Bridges*.—Three of these are of stone, and a fourth was actually built in the year 1705, when the river rising rapidly, in consequence of excessive rains, it was swept away in one night when very nearly finished. The arches being very stout, and the extremities not sufficiently secured, the accident was attributed, by professional persons, to the lateral pressure. Its place has since been supplied by a very handsome wooden bridge for foot passengers. The two bridges highest upon the river are plain, but very well built and paved. The lowest, or new bridge, is very finely executed, and is esteemed one of the most complete specimens of this species of architecture in Britain.

*Water-works*.—The city of Glasgow, until lately, was supplied with water by pit-wells, and the water of these, although abundant in quantity, was of inferior quality both for washing and culinary purposes; as, besides other impurities, it holds in solution a considerable portion of marine acid, by which it is rendered hard and brackish. To remedy this inconvenience a public company was formed, who, at the expense of upwards of 65,000*l.*, brought water filtered from the river into every part of the city and suburbs, by cast iron pipes, and from these pipes into every house, upon receiving a moderate annual payment from the proprietor or tenant. The capital necessary was raised by transferable shares of 5*l.* each. The rapidity with which these shares were bought induced others to form a separate canal company, and to raise water also from the river for the supply of the city. The first supply is drawn from the Clyde by two large steam engines, into a reservoir about two miles to the eastward of the town. From this reservoir it is filtered into a cistern, and from thence conveyed by the pipes to a third reservoir contiguous to the town. The whole lower part may be supplied from this without further forcing, but to supply the higher parts, a portion is again forced by another smaller engine to a cistern on a higher elevation, which commands every part above the former level.

The western water-work company draw their supply from the river, to citizens situated in an avenue about one mile west of the town, where it is filtered, and conveyed by pipes, without requiring to be forced a second time. The inhabitants are left to their own free choice from which company to take their supply.

*River Clyde*.—The Clyde takes its rise about 60 miles to the south-east of Glasgow, in the same mountain which forms the sources of the Tweed and the Ayr. Near the county town of Lanark, about 27 miles above Glasgow, it has three remarkable falls or cascades, much visited by strangers. From Lanark to Glasgow it passes through a fine valley, richly wooded in many places, fertile and highly cultivated. From the new bridge or Glasgow, where it becomes navigable, until it terminates in St. George's, or the Irish channel, about 80 miles distant. About thirty years ago, Mr. Goldburn, an eminent engineer, was employed by the city of Glasgow to deepen the river, from the Broomilaw or barbour, to the sea-port towns of Port Glasgow and Greenock, the former situated 21, and the latter 24 miles below the city. This he effected in a very judicious, although gradual and economical manner. The beneficial effects of his plan became soon apparent, have been, every successive year, improving, and must continue

so for many years to come. It began by constructing, on either bank, projecting dykes, or jetties, into the river, at right angles, to the banks on either side, and placed at fixed distances from each other along the whole course of the navigation. These jetties intercept much of the current and gravel washed down by successive floods, and thus supply the materials for ultimate contraction, within the space of a carriage. Besides this, a number of labourers are employed every summer season to draw the bottom of the river, and lodge the fluff which is washed down to the bottom between the projecting jetties. By the constant repetition of this simple process a great part of the river is now contracted to less than one half of its original breadth, and has gained above four feet of additional depth. As the tonnage does, the greater part of which is accounted for this purpose, now exceed 6000 *per annum*, the improvement promise to be continued on a greater scale, till the navigation and it is probable that in a few years the depth of the river may be brought up to the city. The largest barges which go up are about 150 tons, the depth of the channel being nine feet at high water. The gentleman who has directed these improvements thinks, that in a few years this depth may be increased to 14 feet by the present plan.

It was lately proposed to improve the harbour by the construction of wet docks; but a difference of opinion having arisen respecting the controul under which the new provisions were to be placed, the scheme has been suspended, but it is hoped not finally relinquished. The cargoes which are one shilling *per ton* on merchandise, and three on foreign produce, and four-pence on coal, bricks, and other building materials. Manned, carried upon the river, for the improvement of the adjacent country, is exempted from duty.

The country stretching along the banks of the Clyde, for a number of miles both above and below the city, is fertile and, in most places, highly cultivated, and well enclosed. The parish of Gwan, situated on the south bank of the river, is, perhaps, as highly improved as any district in Britain. Besides the natural fertility of the soil, it may be accounted for by the plentiful supply of capital, and manure, which are supplied at cheap rates by water-carriage. It must also be greatly promoted by the disposition of these improvements, landed proprietors, who, either, although abundantly sufficient to maintain themselves and families in comfort and affluence under their personal superintendance, are not so large as to induce them to relinquish the profits and pleasures of cultivating their own property, which, of course, derives the united benefit of their personal industry, and capital, besides that emulation which a lively spirit of rivalry excites among them to surpass each other. The higher land, both to the north and south, are considerably inferior, both in soil and culture, to those in the valley. In every direction round Glasgow, coal, lime, and iron-stone are found in great plenty, and the great advantages to the agricultural and manufacturing classes of the community.

The suburbs of Glasgow, which form the chief residences of the operative tradesmen, are the following:

*Govan*.—A very populous village, immediately adjacent to the city on the south-east, and bounded by the Gowan of Glasgow. This village contains upwards of 20,000 inhabitants, with many manufactories, distilleries, &c. The green serves both for pasture and for the purposes of washing and bleaching. There are a considerable washing-works, and fine walks for the recreation of the inhabitants. The dues of washing and pasture form part of the city revenue. The green contains upwards of 100 acres of ground.

*Braigh*.—

*Briggs ton*—another suburb adjoining to the former, and similar in every respect.

*Corshals*—a village on the opposite bank of the Clyde, governed by a chief magistrate, appointed by the council of Glasgow, and two resident baillies.

*Anderson, Braemarhill, Finnieston, and Partick*.—These four villages lie to the west of Glasgow, on the north bank of the Clyde; they also are residences for operative trademen, and contain several extensive manufactories, viz. three large cotton mills, an extensive printfield, and porter brewery, at Anderson; a large and flourishing glass-work at Finnieston, and the very large stone-mills belonging to the incorporation of bakers at Glasgow, at Partick, where are also the ruins of an ancient castle, formerly belonging to the archbishop.

*Municipal Government of Glasgow.*

This, as formerly remarked, in ancient times, was almost exclusively vested in the archbishop and chapter. Since the reformation, it underwent various changes during the successive alterations of government in Scotland at large. The last arrangement made by royal and parliamentary authority, was early in the 18th century, under William and Mary. It has since been modified by the authority of the Scottish convention of royal boroughs, who exercise this power without dispute. As at present constituted, the government of the city is vested in the lord provost, three merchants, and two trades baillies, the dean of guild, or president of the merchants, the convenor, or president of the trades, the city treasurer, and master of the public works, twelve counsellors from the merchants, and eleven from the incorporated trades, in all 33 counsellors. To this body the regulation of all the public business belongs; the lord provost being president, with the casting or deciding vote in cases of parity. The courts of justice within the city are the following:

1. The circuit court of judicary, for the cognizance of criminal actions, which is held twice a year at Glasgow, for the counties of Lanark, Renfrew, and Dunbarton, generally before two of the lords commissioners, although any one of their number is competent. This court also decides appeals in civil causes from any of the inferior courts within the district.

2. The magistrates or town court. This court is held under the authority of the magistrates, assisted by the town clerks as legal assessors. The jurisdiction of this court extends to any amount subject to an appeal to the court of session.

3. The conscience court, for the decision of petty causes under twenty shillings, where the formality of an oath is dispensed with, or any written pleading.

4. The sitting magistrate also decides daily trifling claims under five shillings. The magistrates also exercise a criminal jurisdiction in petty crimes, and punish by imprisonment, pillory, and sometimes public whipping and banishment from the city.

5. The sheriff court, for the under-ward of Lanarkshire, is also held at Glasgow, before the sheriff substitute. His jurisdiction is equal to that of the magistrates, not only within the city, but the district. The decisions of this court are subject by appeal to the sheriff depute and to the court of session.

6. The justice of peace court also decides civil causes to a limited amount, and regulates disputes between masters and servants. The appeal from this court is to the quarter sessions, and finally to the court of sessions.

7. The small debt court is held by two or more justices, for the decision of causes under 10*l.* No professional law-

yer is heard here, and the pleadings are verbal. They review their own decisions upon appeal, provided the sum decreed for be lodged with the clerk of court.

8. The commissary court is the remnant of the bishop's court. It decides for sums under 3*l.* 6*s.* 8*d.*, and also in cases of defamation. Its jurisdiction extends over all the ancient bishopric.

*Police Establishment*.—This establishment was constituted a few years ago under the authority of a special act of parliament. The commissioners named in the act are, the lord provost and baillies, and twenty-four commissioners elected by twenty-four wards, into which number the city is divided. The qualification of a commissioner, is the occupation of a dwelling house valued at 15*l.* or upwards of yearly rent; and of a voter, that of any house at 10*l.* or upwards. The business of this establishment is the lighting, cleaning, and guarding of the streets, and suppression of quarrels, riots, and other breaches of the public peace. For this purpose a master, or intendant of police officers, and watchmen are employed. A magistrate sits every morning at the police office to decide upon those who have been apprehended during the night. Where the charge is serious, he generally remits the cognizance of it to the town court, and punishes petty delinquencies by a small fine. The expence is defrayed by a tax on the valued rents of shops, warehouses, and dwelling houses, by fines levied in the course of the year by the sale of manure, from cleaning the streets, &c. The maximum of the tax is from 6*d.* to 1*s.* 3*d.* per pound of valued rent, but much less has been generally found sufficient. This institution has been always hitherto conducted with the most vigilant attention to economy, and is very popular even among those of the citizens, who strenuously opposed its original adoption.

*Commerce and Manufactures*.—The commercial importance of Glasgow only began to rise subsequently to the Union, and had attained no very important extent until the colonization of North America opened a wide field for the exportation of British commodities and the importation of American produce in return. Previous to the commencement of the American war in 1775, it had, however, engaged very extensively in the tobacco trade, for it appears that of 90,000 hhds. of tobacco imported into Britain in 1772, 49,000 hhds. were brought into the Clyde alone, and, in 1775, the importation was 57,143 hhds.

The operations of the war necessarily put a stop to this intercourse, to the great loss of the merchants engaged in it; many of whom have never been able to recover their debts. Upon the restoration of peace in 1783, the trade with America revived, and continued again in a flourishing state, until again recently suspended by the American non-intercourse act. In 1783, the registered vessels of the Clyde, were 386, and their tonnage 22,896, and in 1803, the number cleared outwards and inwards was as follows.

At Greenock inwards,			
Foreign trade	406 ships,	53,546 tons,	5183 men.
Coast and fishing	730 vessels,	35,532	3147
Outwards,			
Foreign trade	352 ships,	50,566 tons,	3673 men.
Coast and fishing	1016 vessels,	43,009	3326
At port Glasgow inwards,			
Foreign trade	113 ships,	18,722 tons,	1081 men.
Coast and fishing	182 vessels,	7,226	551
Outwards,			
Foreign trade	177 ships,	25,137 tons,	1692 men.
Coast and fishing	119 vessels,	7,202	424
Total	3095	238,790	17,077

From



From this note some idea may be formed of the extent of the trade; but many of these vessels having probably made several voyages in the course of the year, it is not to be inferred that this number of vessels actually belongs or trades to the Clyde. The articles of exportation are chiefly British manufactured goods, coals, fish, &c. and the imports European, American, and colonial produce.

The city of Glasgow had also a very considerable commercial intercourse with the eastern parts of the island, and with the northern states of Europe, until this was suspended by the events of the war. This intercourse is carried on by means of the Forth and Clyde canal, which intersects Scotland, and forms a junction between the eastern and western seas, some account of which has already been given under the article CANAL.

The manufactures of Glasgow had obtained no very great extent previous to the commencement of the American war, although they had been progressively advancing during the whole course of the eighteenth century. So far back as the reign of Charles II. indeed, some attempts had been made to introduce the manufacture of soap, refining of sugar, and some other branches, all of which proved abortive, and were discontinued. The linen manufacture was the most extensive of the various attempts made, and the most successful during the time that it lasted. It commenced about the year 1725, and continued progressively advancing until it was almost entirely superseded by the cotton towards the close of the century. The cotton manufacture, which is now unquestionably the staple trade of Glasgow, was prosecuted to very small extent until after the year 1784, but when once introduced it advanced with unprecedented rapidity. It is impossible to ascertain with any precision its actual amount either in quantity or value at any given period for want of proper data. A computation in 1791 makes the number of looms employed 15,000, and the persons who earned their subsistence by various parts of the processes of spinning, weaving, bleaching, &c. 135,000. It also estimates the total value of the goods made yearly at 1,500,000*l.* The grounds of this calculation are not stated, and little reliance can be placed on it, for the value of cotton goods has fluctuated as remarkably as the quantity has extended.

Two manufactories of earthen ware are carried on in Glasgow, but neither of them extensively. Indeed a much greater quantity of Staffordshire ware is used in the city itself than of the produce of either. Two or three rope works are also carried on, but to no great extent.

The printing of calicoes and other goods is, however, a very extensive branch of the manufacture of Glasgow and its vicinity. The most extensive of these works, are those situated upon the water of Leven, in Dumbartonshire, about 18 miles distant. The extension of the cotton trade has also greatly improved and enlarged the number of dye-works, and the manufactures of chemical preparations for the various processes of bleaching, dyeing, and printing. These works are situated in the vicinity of the city, chiefly on the banks of the river.

Of the chemical works carried on in Glasgow, some are peculiar to it.

The manufacture of Cudbear was introduced by Mr. Mackintosh so long ago as the year 1777. It is prepared from *rack-moss*, and above 2000 gallons of linnish urine are daily consumed in the process. The cudbear gives a dark reddish colour, and is used in the dyeing of leather, woollen stuffs, &c. The process is kept profoundly secret.

The discharging of the Turkey red dye is also peculiar to Glasgow. This process is particularly described under the article *Discharging of COLOUR*.

The manufacture of the oxy-muriate of lime, in a dry form, for the purposes of bleaching, &c. is also almost peculiar to Glasgow. Its object is to decolor the expense of bleaching by the substitution of lime for potash. This article is made to great extent by Mr. Tennent the inventor.

Iron liquor, for the use of printers, is made here by various persons, and large alum works are established in the neighbourhood. Manufactures of red and white lead are also carried on.

#### *Miscellaneous Remarks.*

It will appear that the city of Glasgow has undergone three remarkable changes. Its first state was the residence of a great arch-bishopal see, and consequently it was for many ages entirely under clerical influence and controul. Its first eminence as a commercial place arose from its favourable situation for commerce with the American and West Indian colonies, and through this traffick it made rapid advances in commercial importance during the whole course of the eighteenth century. One branch of this traffick being at least for the present suspended, it now depends chiefly on the other, and upon its manufactures for support. From the facilities of acquiring a good education, the inhabitants of Glasgow have generally added a considerable taste for literary attainment even to their commercial habits, and this style prevails, perhaps, in a degree superior to any other commercial place in Britain. The system of education is, however, rapidly adapting itself to the modern pursuits of the inhabitants, and more pains are now taken to qualify the rising generation for eminence in the counting-house than the closet. However desirable a thorough knowledge of the principles of commercial economy, and the details of business may be in a commercial community, it is still to be hoped, that all the benefits arising from intellectual attainment will not be deemed altogether nugatory, and consequently neglected. In every situation of life, they are sources of rational and innocent amusement, and, in the vicissitudes to which commercial enterprise is peculiarly exposed, may often prove of real benefit and ability to the possessor.

The city of Glasgow returns a member to the British parliament, conjunctly with the neighbouring burghs of Rutherglen, Renfrew, and Dumbarton.

GLASGOW, *Port*, situated on the river Clyde, about 22 miles below the city, is a handsome small town, and was projected by the magistrates of Glasgow at the request of the merchants as a harbour for their ships and vessels. It is said that the first plan was to improve the harbour of Dumbarton for this purpose, but Dumbarton being a royal borough, the consent of its magistrates became necessary, and that when made, it was rejected by that body, who preferred the full enjoyment of their chartered privileges to the idea of sinking into the mere sea-port of Glasgow, however much their wealth, revenue, population, and general prosperity might be benefited by such an union. If this were the case, it is one among the numberless instances where comfort and prosperity have been sacrificed to a mere empty title. The harbour of port Glasgow is good but shallow. The disadvantage of the bank, noticed in the article GREENOCK, is also much against it as a haven. At port Glasgow there is a custom-house, where the general customs of the Clyde are collected. There is here also a fine graving, or dry dock, built by the merchants of Glasgow long before that of Greenock was executed, and this circumstance alone brought many ships up to this port which now come no farther than Greenock. The situation of port Glasgow is more pleasant than that of Greenock, the country more level, and better adapted for cultivation. In other respects it is certainly

efs calculated for the general purposes of maritime traffick than its rival, and therefore there is little probability of its extension. Indeed the shipping belonging to Glasgow is certainly on the decrease, the foreign merchants finding it more for their advantage to freight or charter vessels for any purpose than to build or buy vessels of their own, which both consume or sink a considerable portion of their capital, and may, from the many casualties and fluctuations to which commerce in this eventful age is exposed, prove rather burthens than advantages, while the mere ship-owner, if deprived of a freight or charter-party at one port, may with greater facility seek it at another, than the person with whom freight is only a secondary and inferior consideration.

Port Glasgow is governed by magistrates, appointed by the council of Glasgow, and some resident magistrates. Its exports and imports have been already given and compared with those of Greenock under the article GLASGOW, which indeed furnishes by far the greater part of the freight to and from both ports.

There are no manufactures here of any extent, excepting those which are to be found at almost all sea-port towns, *viz.* ship building and rope spinning. Both of these are carried on to a very considerable extent. A work was erected some years ago for refining of sugar, and also a small cotton-mill, but neither have ever been prosecuted to any great extent.

A plan has been formed, and its execution is now begun, which in time may produce a great effect, both on this town and Greenock. This plan has for its object the formation of a more direct communication between Glasgow and the west sea, than the present circuitous navigation of the Clyde, by means of a navigable canal to be carried from Glasgow to Ardrossan, near Irvine, which is about thirty miles farther down the river than the present seaports. This canal was projected under the sanction and patronage of the present earl of Eglintoun, (lord Ardrossan of Great Britain,) a part of whose estates lie in that neighbourhood. Its objects are two-fold. First, to facilitate the maritime intercourse of Glasgow and Paisley with the New World, by a more direct channel and better harbour. Second, to improve the agricultural and internal state of Renfrewshire, and the northern district of Ayrshire, by affording means for the cheap conveyance of coal, lime, manure, and other heavy articles by means of the canal. Ardrossan is situated not more than thirty miles from Glasgow, by the line of the projected canal, and therefore the carriage of goods will not be more expensive or tedious than by the Clyde, for the canal being free from the constant interruptions arising from the operation of wind and tide upon the river, the time of arrival and departure may be depended upon at all seasons and in all weathers. A considerable sum has already been subscribed for the canal, and also for the harbour, and from the well-known energy and activity of his lordship's general character, there is no reason to doubt that every exertion for its speedy completion will be used.

It is natural to expect that every opposition will be given by those whose local interests will suffer by the success of this undertaking, and these comprehend many wealthy and powerful classes; but whilst some oppose, others will find it their interest to promote it, and the competition must be ultimately advantageous to the general body, however it may terminate as to those more immediately interested.

The other part of the plan is the formation of an excellent and secure harbour at Ardrossan, capable of receiving ships of large burthen, and this also is begun. The subscriptions for the two undertakings are conducted separately. The coast here is in some places reckoned dangerous during the

prevalence of strong gales from the north-west, when vessels are making the land; but it is said that the bay of Lamfash, in Arran, will afford a safe and easy shelter within a few hours sail, when this may prove to be the case. The surveys, plans, and estimates for the canal and harbour of Ardrossan were made under the superintendance of Mr. Telford. It must be possibly evident that the canal will in all respects produce much benefit; it passes through the most populous and flourishing manufacturing district in Renfrewshire.

GLASGOW, a new county of America, in Newbern district, North Carolina, taken from Dobbs's county: bounded E. by Edgecomb, S. by Lenoir, E. by Pitt, and W. by Wayne. — Also, a town of New York, on the E. coast of Lake Cayuga; eight miles S. of Cayuga.

GLASS, in the general acceptation of this term among *Chemiſts*, denotes any substance or mixture, earthy, saline, or metallic, which is reduced by igneous fusion to the shape of a hard, brittle, uniform mass, which breaks with a conchoidal fracture, passing into splintery, and with a high degree of lustre. Most glasses of this kind are also transparent. See VITRIFICATION.

GLASS, *Vitrum*, in a more restricted sense, and as the term is commonly used in the *arts and manufactures*, signifies that transparent, solid, brittle, faccitious substance, produced by the vitrification of siliceous earth with various salts and metallic oxyds, which is applicable to innumerable purposes of ornament and comfort, as well as of scientific investigation and research.

As to the antiquity of the term *glasse*, Tacitus (*Germ.* c. 45.) and Pliny (*l.* xxxvii. c. 3.) inform us, that amber was called among the ancient Gauls or Germans by the name of *glafum* or *gleffum*; and from the similarity which glass bore to amber with respect to transparency and brightness, it acquired a name, which was, in all probability, originally the same. The word *glafum* denoted, without doubt, a shining or transparent substance, as *glaffen* expresses at present in the German language to shine; and our English word to *gliffen* is derived from it, and has nearly the same signification. DuRoiſe says that some critics were of opinion, that the word *glafum* itself implied glass rather than amber. The ancient Greeks, as it has been observed, applied the same term (*κρυσταλλος*) both to glass and amber. The herb with which the Britons painted their bodies had also the name of *glafum*, perhaps from the shining appearance it might give to their skins, or possibly because its ashes might be used in the making of glass. The Latins called the same plant by the name of *vitrum*, the word they used to signify glass. (Caſar. *Bell. Gall.* l. v.)

We find frequent mention of this plant in ancient writers, particularly Caſar, Vitruvius, Pliny, &c. who relate, that the ancient Britons painted or dyed their bodies with *glafum*, *quadam*, *virum*, &c. *i. e.* with the blue colour procured from this plant. And hence, as some have supposed, the faccitious matter we are speaking of, came to be called glass, as having always somewhat of this business in it.

Merret (*Not. in Ant. N. ride Art. Vitrum*) gives us the following characters or properties of glass, by which it is distinguished from all other bodies, *viz.* 1. That it is an artificial concrete of salt and sand, or stones. 2. Hard by a strong fire. 3. When fused, tenacious and coherent. 4. It does not waste or consume in the fire. 5. When melted, it cleaves to iron. 6. Ductile, when red-hot, and fashion-able into any form, but not malleable; and capable of being blown into a hollowness, which no mineral is. (See *DESCRIPTION of Glass*.) 7. Frangible when tam. without annealing. 8. Friable when cold. 9. Always displacour, whether hot or cold. 10. Flexible and elastic. 11. Dissoluble by cold and moisture. 12. Only capable of being graven, or cut with a diamond

diamond or other hard stones, and emery. 13. Receives any colour or dye, both externally and internally. 14. Not dissolvable by aquafortis, aqua-regia, or mercury. 15. Neither acid juices, nor any other matter, extract either colour, taste, or any other quality, from it. 16. It admits of polishing. 17. Neither loses of weight nor substance, by the longest and most frequent use. 18. Gives fusion to other metals, and softens them. 19. The most pliable thing in the world, and that which best retains the fashion given it. 20. Not capable of being calcined. 21. An open glass, filled with water in the summer-time, will gather drops of water on the outside; just so far as the water on the inside reaches; and a man's breath blown upon it will manifestly moisten it. 22. Little glass balls, filled with water, mercury, and other liquor, and thrown into the fire, as also drops of green glass broken, fly asunder, with a loud noise. 23. Neither wine, beer, nor any other liquor, will make it milky, nor change its colour, nor rust it. 24. It may be cemented as stones and metals. 25. A drinking-glass, partly filled with water, and rubbed on the brim with a wet finger, yields musical notes, higher or lower, as the glass is more or less full; and this makes the liquor frisk and leap. See ARMONICA. For the electrical properties of glass, see ELECTRIC, &c.

GLASS, *origin and history of.* De Neri will have glass as ancient as Job; for that writer, chap. xxviii. ver. 17. speaking of wisdom, says, "gold and glass cannot equal it."

This, we are to observe, is the reading of the Septuagint, Vulgate Latin, St. Jerom, Pineda, &c. for in the English version, instead of glass, we read *crystal*; and the same is done in the Chaldee, Arias Montanus, and the king of Spain's edition. In other versions, &c. it is read *stone*; in others *beryl*: in the Italian, Spanish, French, High and Low Dutch, &c. *diamond*; in others, *carbuncle*; and in the Targum, *looking-glass*.

In effect, the original word is *chubith*, (חִבְיִית) which is derived from the root *zaccac*, to purify, cleanse, shine, be white, transparent: and the same word (Exod. xxx. 34.) is applied to frankincense; and rendered in the Septuagint *pellucid*. Hence the reason of so many different renderings; for the word signifying *beautiful* and *transparent*, in the general, the translators were at liberty to apply it to whatever was valuable and transparent.

Herodotus (l. iii.) is, according to Dr. Falconer (Manchester Memoirs, vol. ii.), the most ancient writer (B. C. 440) who used the word *υαλας*, which is generally understood to signify glass. But he evidently does not mean artificial glass, nor crystal, but, most probably, somewhat of the talcky kind, or lapis specularis, which might readily be framed in such a manner, as to form a convenient transparent case, such as the ancient historian has described. Aristophanes (B. C. 400) seems to be the next writer who mentions glass: that poet, in his comedy called the Clouds, scene 1. act. 2. uses the word *υαλας*, which is now ordinarily rendered glass. He there introduces Strepsiades teaching Socrates a new way to pay old debts, viz. "by placing a fair transparent stone, fold by the druggists, from which the fire is struck, between the sun and the writing, and so melting away the letters thereof." This stone Socrates calls *υαλας*, which the Scholiast on Aristophanes derives from *υα*, to rain, from the likeness it bears to ice, which is rain, or water congealed; though, it must be owned, the word *υαλας* is ambiguous, and signifies *crystal* as well as *glass*: and Gorraeus observes, that the ancients had a kind of yellow amber, transparent as glass, called by some *υαλας*.

Aristotle (B. C. 340) has two problems upon glass: the first, Why we see through it? The second, Why it is not malleable? If these problems be Aristotle's, which the learn-

ed doubt very much, this would properly be the earliest testimony in favour of the antiquity of glass. Theophrastus (B. C. 303) seems to have been well acquainted with glass; for he describes it as having been made of the sand of the river Belus, which was called *υαλας*, to which he adds, that the commonest kinds are made with copper. The celebrated sphere of Archimedes (B. C. 209), if it be truly described, is a remarkable instance of the perfection to which the art of making glass had been brought at that early period.

Lucian mentions large drinking glasses; and Plutarch, in his Sympoticon, says, that the fire of tamarisk wood is the fittest for making of glass.

Among the Latin writers, Lucretius is the first that takes notice of glass; "Nil recta foramina trahant, qualia sunt vitri;" lib. vi. v. 3. Dr. Merret, however, adds, that glass could not be unknown to the ancients, but that it must needs be as ancient as pottery itself, or the art of making bricks; for scarcely can a kiln of bricks be burnt, or a batch of pottery-ware be made, but some of the bricks and ware will be at least superficially turned to glass.

Hence, Ferrant, Imperator, lib. xxv. cap. 7. "Glass, like the common kind, is found under ground, in places where great fires have been. Other glasses are found in round clods, like fire-stone, some brittle, others firm, &c. This fossil glass is wrought by the Americans, and used instead of iron. And no doubt but vitrifications were more common in the ancient bricks than they are in ours; as they tempered their earth two years together, and burnt them better.

Virgil (B. C. 39) compares the clearness of the water of the Fucine lake to glass. *Æneid*, v. 759. Horace (B. C. 36) is more express, and mentions glass in terms that shew its clearness and brightness to have been brought to great perfection. *Carm. iii. Od. 2. Od. 13*. In the time of Strabo, (A. D. 27) the manufacture of glass was undoubtedly well understood, and had become a considerable article. Seneca (A. D. 65) was not only well acquainted with glass as a substance, but also understood its magnifying powers when formed into a convex shape. *Quæst. Natur. lib. iii. vi.*

Pliny (A. D. 77) relates the manner of the discovery of glass. It was first made of sand, according to that author, (Nat. Hist. l. xxxvi. c. 66, &c.) found in the river Belus, a small river of Galilee, running from the foot of mount Carmel, out of the lake Cendevia. The part of the shore where the sand was dug did not exceed 500 paces in extent, and had been used many ages before for the same purpose. The report of its discovery was, that a merchant ship, laden with nitre, or fossil alkali, being driven upon the coast, and the crew going ashore for provisions, and dressing their victuals upon the shore, made use of some pieces of fossil alkali to support their kettles. By these means a vitrification of the sand beneath the fire was produced, which afforded a hint for the manufacture. In process of time the calc of iron, in form of the magnetical stone, came to be used along with the fossil alkali, from an idea of its not only containing iron, but glass, in a liquid form. Clear pebbles, shells, and fossil sand, were also in many places employed for the same purpose. It is said, that in India pieces of native crystal were used for that purpose; and on that account the Indian glass was preferred to any other. Pliny adds, that light and dry woods were used for the melting of glass; to which they added copper from the island of Cyprus, and the fossil alkali, especially that which is brought from the East Indies. The furnaces are kept burning without intermission, that the copper may be melted with the glass, and out of this compound are made masses of a coarse blackish colour. These lamps or masses are

again melted, and tinged of the colour required. Some of these pieces are brought to the shape required by blowing with the breath; some are ground on a lathe, and others are embossed in the same manner as silver. Sidon was formerly famous for these manufactures, as specula or looking-glasses were first invented there; "siquidem etiam specula excogitaverat." Such is the ancient method of making glass, described by Pliny. In his time, it was made with sand found at the mouth of the river Vulturnus, upon the shore, for six miles between Cumæ and the Lucrine bay. This sand was very fine, and was ground to powder with a ball or sphere and a mill. It was then mixed with three parts of the fossil alkali, either by weight or measure; and being fused, was conveyed in a liquid state into other furnaces, where it was formed into a mass, called "ammonitrum," (or sand combined with the fossil alkali,) which mass was melted, and became then pure glass, and a mass of white vitrified matter. The same method of making it prevailed in Spain and Gaul. Glass was likewise made to imitate the lapis Obsidianus, a substance found by a person of the name of Obsidius, in Egypt and Ethiopia. This substance was of a very black colour, yet obscurely transparent, and often placed among specula in the walls of rooms, to reflect the shadow of objects. It was also used for the same purpose as gems (probably for engraving upon) and even for statues. Pliny mentions, that he saw solid statues of the emperor Augustus made of this material; and the same emperor dedicated four elephants made of the same substance in the temple of Concord. It seems to have been used from great antiquity; but in the time of Pliny the artificial imitation of it by glass was used instead of the native material; and he intimates that the black colour was produced by some colouring ingredient. The Romans had likewise an opaque red kind of glass, used for plates and dishes for the table, called "hematiton," one of various colours, called "myrrhinum," a white, a clear red, a blue, and indeed most other colours. Pliny observes, that no substance was more manageable in receiving colours, or being formed into shape, than glass. The perfectly clear glass, which bore the greatest resemblance to crystal, was, however, most valued. Nero gave for two cups, with two handles to each, and of no extraordinary size, 6000 sesteria, or nearly 50,000 l. sterling. The inferior kinds were not uncommon, as Pliny informs us, that the use of glass cups had nearly superseded those of gold and silver. We shall here add, that Pliny knew the power of a hollow glass globe, filled with water, in concentrating the rays of light, so as to produce flame in any combustible substance upon which the focus fell; and he also mentions, that some surgeons in his time made use of it as a caustic for ulcers (l. xxxvii. c. 2.). He was likewise acquainted with the comparative hardness of gems and glass, as he observes, that the lapis Obsidianus would not scratch the true gems; and he also mentions (l. xxxvii. c. 13), the counterfeiting of the latter, in his time, as a very lucrative art, and brought to great perfection. He also says, that glass might be cut or engraven upon by means of diamonds, which art is evidenced by the antique gems so frequently found (See GEM.) Josephus, (l. ii. c. 10.) mentions the sand of the river Belus, in Galilee, as fit for making glass.

The first time we hear of glass made among the Romans was in the reign of Tiberius, when Pliny relates that an artist had his house demolished for making glass malleable, or rather flexible; though Petronius Arbitrator, and some others, assure us, that the emperor ordered the artist to be beheaded for his invention. In the time of Martial, (A. D. 84) glass was not only brought to great perfection,

and in common use for drinking vessels, but was employed (as it seems) for bottles in which wine was kept, and likewise for pots to hold flowers. (Epig. l. i. ii. 22. 40. l. iv. 86.) Galen (A. D. 143) frequently mentions glass in several parts of his works, and seems to have been well acquainted with the method of making it. Apuleius (A. D. 161) mentions the manufacture of glass cups, in his time, as highly wrought and carved in various ways, and of great value. Alexander Aphrodisiensis (A. D. 214) a Greek writer, and a commentator on Aristotle, has several remarks on glass respecting both its brittleness, especially on change of temperature, and its transparency.

The manufacturers of glass formed a company at Rome, and had a street assigned them, in the first region of the city, near the Porta Capena. A tax was laid upon them by Alexander Severus (A. D. 220) which subsisted in the time of Aurelian, and probably long after.

Mr. Nixon, in his observations on a plate of glass found at Herculaneum, which was destroyed A. D. 80, on which occasion Pliny lost his life, offers several probable conjectures as to the uses to which such plates might be applied.

Such plates, he supposes, might serve for *specula*, or looking-glasses; for Pliny, in speaking of Sidon, adds, "siquidem etiam specula excogitaverat;" the reflection of images from these ancient specula being effected by reflecting them behind, or tinging them through with some dark colour. (See MIRROR.) Another use in which they might be employed, was for adorning the walls of their apartments by way of wainscot, to which Pliny is supposed to refer by his *vitrea camera* (lib. xxxvii. cap. 25. § 64.). Mr. Nixon farther conjectures, that these glass plates might be used for windows, as well as the laminae of lapis specularis and phengites, which were improvements in luxury mentioned by Seneca, and introduced in his time, Ep. xc. However, there is no positive authority relating to the usage of glass windows earlier than the close of the third century: "Manifestius est," says Lactantius, "mentem esse, per oculos ea quæ sunt opposita, transpiciat, quasi per fenestras lucente vitro aut speculâ lapide obductas." De Opificio Dei, cap. 5. See Phil. Transf. vol. l. art. 80. p. 601. vol. lii. art. 23. p. 123.

St. Jerome (A. D. 422) speaks of windows formed of glass, melted and cast into thin plates, as being used in his time. Paulus Silentarius, a poet and historian of the 6th century (about A. D. 534), speaks of the brightness of the sun's rays, passing through the eastern windows of the church of St. Sophia, at Constantinople, which windows were covered with glass. Gregory of Tours (A. D. 571) laments the devastations frequently committed on the windows of the churches by the ravages of war. Johannes Philoponus, who lived about the year 630, or, as some say, a century earlier, not only speaks of glass, but of the panes being fastened in with plaster, much in the same way as at present.

If the opinion of Pennant, suggested under the article *ANGUINUM ORUM*, be well founded, we have reason to believe, that, long before the conquest of Britain by the Romans, the art of manufacturing glass into such ornaments as beads and amulets was known among the Druids; and if the art was thus applied, it is not improbable to suppose, that it was employed for more important and useful purposes, as in the manufacture of glass vessels. Nor is it likely that the Britons derived this art from the Romans, who preferred silver and gold to glass for the composition of their drinking vessels. Besides, the glass that was commonly used by the Romans was of an inferior quality, and appears from some remains of it discovered at their stations

and

and houses to have consisted of a thick, sometimes white, but mostly blue-green, metal.

According to venerable Bede, artificers skilled in making glass were brought over into England, in the year 674, by abbot Benedict, who were employed in glazing the church and monastery of Weremouth. According to others, they were first brought over by Wilfrid, or Wigfrid, bishop of Worcester, about the same time, or, as others think, at a later period, A. D. 726. Till this time the art of making glass, or at least of applying it to this purpose, was unknown in Britain: though glass windows did not begin to be used before the year 1180: till this period they were very scarce in private houses, and considered as a kind of luxury, and as marks of great magnificence. Italy had them first, next France, from whence they came into England.

Leo Ostiensis (A. D. 760) speaks of the windows in his time being made with glass-plates fixed in lead, and fastened together with iron. Anastasius, an historian of Rome, who was librarian to the pope, mentions, that in the pontificate of Leo III. who became pope about the year 800, painted glass in windows was in use. The statutes of the church of Traguier, in Lower Britany, about the year 1156, speak of the windows of churches and chapels being ornamented with arms and military ensigns, painted upon the glass in them. A charter of Richard II. of England, quoted by Rymer, (A. D. 1386), contains a paragraph in which is mentioned glass, together with the manufacture of it for windows.

Venice, for many years, excelled all Europe in the fineness of its glasses; and in the thirteenth century, the Venetians were the only people who had the secret of making crystal looking-glasses, and which they performed by blowing, much in the same manner as a considerable quantity of the common mirror-glass is now manufactured. The great glass-works were at Murano, or Murano, a village near the city, which furnished all Europe with the finest and largest glasses.

The glass manufacture was first begun in England in 1557: the finer sort was made in the place called Crutched Friars, in London; the fine flint glass, little inferior to that of Venice, was first made in the Savoy-house, in the Strand, London. This manufacture appears to have been much improved in 1635, when it was carried on with sea-coal or pit-coal, instead of wood, and a monopoly was granted to sir Robert Mansell, who was allowed to import the fine Venetian flint glasses for drinking, the art of making which was not brought to perfection before the reign of William III. But the first glass plates, for looking-glasses and coach windows, were made in 1673, at Lambeth, by the encouragement of the duke of Buckingham; who, in 1670, introduced the manufacture of fine glass into England, by means of Venetian artists, with amazing success. So that within a century past, the French and English have not only come up to, but even surpassed, the Venetians, and we are now no longer supplied from abroad.

The French made a considerable improvement in the art of glass, by the invention of a method to cast very large plates, till then unknown, and scarce practised yet by any but themselves and the English. That court applied itself with a laudable industry to cultivate and improve the glass manufacture. A company of glass-men was established by letters patent; and it was provided by an act, not only that the working in glass should not derogate any thing from nobility, but even that none but nobles should be allowed to work therein.

It was in the year 1665, under the ministry of the great Colbert, that a company for "blown-mirror-glass" was

first established near Cherbourg, in Normandy, on the plan of the Venetian manufacture; but the beautiful art of casting glass was invented in France about the year 1688; by a person of the name of Abraham Thevart; and a company was soon established for this branch of manufacture, which was first carried on at Paris, and soon after removed to St. Gobin, where it still exists in full activity, and undiminished reputation. An extensive manufactory of this kind was first established among us near Preston in Lancashire, about the year 1773, by a respectable body of proprietors, who were incorporated by an act of parliament. They struggled for a considerable time with difficulties; but being nobly relieved and encouraged by government, they have succeeded in producing plates rivalling, if not surpassing in size, quality, or brilliancy, the most celebrated continental manufacturers. This company furnishes, at Allion Place, London, plates of various dimensions, from 12 to 144 inches in length, and from 10 to 72 inches in breadth; and also convex and concave mirrors, from 12 to 36 inches in diameter.

*GLASS, Ingredients of.* The materials used in the composition are some saline substance and some sort of siliceous earth.

1. The first ingredient we shall specify is flint. The best is that which will melt, and which is white and transparent. It is this that gives consistence and firmness to the glass. This is found principally in Italy, being a sort of stony substance called *tarso*: the next is *puccioli*, or *cuogola*, a sort of pebbles found at the bottoms of rivers, and gathered for the Venetian manufacture out of the river Po, which are said not to be inferior in whiteness to alabaster.

Indeed, nothing makes finer and clearer glass than common flint, distinguished for this use by its clear transparent, black colour; this, before it is used, must be heated red-hot, and then immediately quenched in cold water. The heat whitens it, and the water causes it to split in every direction, and facilitates the grinding of it. The charge of preparing this deters the glass-men from using it. The rounded fragments of quartz, found in the beds of rivers among mountains, are sometimes used in foreign countries, being first heated and ground to powder. Indeed, the preparation necessary for stone, in general, is to calcine, powder, and searce it.

Ant Neri observes, that all white transparent stones, which will not burn to lime, are fit to make glass; and that all stones which will strike fire with steel, are capable of being employed in making of glass. But this latter rule, Dr. Merret observes, does not hold universally. Where proper stone cannot be had, sand is used; and it is now almost the only kind of substance employed in the British manufactures of glass. The best for this purpose is that which is white, small, and shining; examined by the microscope, it appears to be small fragments of rock crystal. For green glass, that which is of a soft texture, and more gritty; it is to be well washed, which is all the preparation it needs. Our glass-houses are furnished with white sand for their crystal glasses from Lynn in Norfolk, and Marlborough in Kent, and from the western extremity of the Island of Wight; and with the coarser, for green glass, from Wexford.

2. The second ingredient in the manufacture of glass is an alkali, which is either soda, or pot-ash. It is always used at first in the state of carbonate, though the carbonic acid flies off in the process. For the method of preparing each, see CARBONATE. These alkalis are used in different degrees of purity according to the required quality of the glass. The finest sort of glass requires the best purification, purified by solution and evaporation, to whiteness; but for inferior glasses coarser alkalis, such as chalk,

wood-ashes, and kelp, are employed. The ashes of fern will also yield a salt, which will make excellent glass; and, moreover, the ashes of the pods and stalks of beans, as also those of coleworts, bramble bush, millet-stalks, rushes, cyperuses, and many other plants, may be used for the like purpose, and after the same manner.

There are other fluxes used for different kinds of glass, and for various purposes. Lime, in the form of chalk, is employed in the manufacture of glass; but this must be used only in small proportions; for an excess would act powerfully on the sides of the glass-pots, in consequence of the escape of the carbonic acid from the chalk during the fusion, and, besides, it would render the glass opaque and milky in cooling, however clear it might be when hot. It is known by experience, that to 100 parts of silice and the requisite quantity of alkali, no more than about six or seven parts of quick-lime, or chalk, can be added, without affecting the clearness of the glass. Borax is another very valuable flux; but its high price restricts the use of it to the finest kinds of glass, and to those which are required to be free from specks and bubbles. A very small quantity of borax will correct any deficiency of strength in the glass.

Of the oxids of lead, litharge and minium are found to be of singular use in the manufacture of glass. Litharge is a powerful flux, and imparts to glass the valuable qualities of greater density and greater power of refracting the rays of light, and of bearing sudden changes from heat to cold, without being so liable to crack, and also greater tenacity when red-hot, so that it is more easily wrought. A considerable quantity of this oxyd is contained in the finer glasses; such as the London flint glass, and that which is used for the table, for lustres, for artificial gems, and for most optical purposes. Glass, however, that contains much lead, is extremely soft; and liable to be injured by hard bodies that come into contact with it; and it is also very fusible. It is also liable to be corroded by very acrid liquors. Besides, the use of lead renders it difficult so to unite the silice and alkali, that a piece of glass shall be throughout of uniform density. Another ingredient occasionally used in glass is the black oxyd of manganese, called "glass-soap," from its use in clearing the glass from any accidental foulness of colour, and more especially from the green tinge, owing to the presence of iron. Scheele and Bergman in their respective "Essays," have illustrated many curious circumstances that attend the use of manganese in glasses, which are particularly detailed in Aikin's Dictionary. The manganese should be chosen of a deep colour, and free from specks, of a metalline appearance, or a lighter cast; and it requires to be well calcined in a hot furnace, and then to undergo a thorough levigation. The effect of manganese in destroying the colours of glass is accounted for by M. Montamy, in his "Traité des Couleurs pour la Peinture en Email," in the following manner; the manganese destroys the green, olive, and blue colours of glass, by adding to them a purple tinge, and by the mixture producing a blackish brown colour; and as blackness is caused merely by an absorption of the rays of light, the blackish tinge given to the glass by the mixture of colours, prevents the reflection of so many rays, and thus renders the glass less coloured than before. But the black produced by this substance suggests an obvious reason for using it very sparingly in those compositions of glass, which are required to be very transparent.

This purple colour may be corrected by charcoal, or in the glass-house, by thrusting a billet of wood down into the melted glass, which becomes charred by the intense heat, and

causes the purple hue to vanish, with a slight effervescence of the glass, and escape of numerous small air-bubbles. On the other hand, if a small quantity of nitre is added to glass containing manganese, the purple colour is restored, or, if present, the discolouring effect of the charcoal is prevented, till the nitre becomes alkalinized by the heat, and mixes with the other ingredients of the crucible. For the explanation of these phenomena, it is observed, that the oxyd of manganese gives the purple colour only so long as it remains in its higher state of oxygenation; but when in contact with charcoal, the latter partially deoxygenates it, carbonic acid gas is formed, the cause of the bubbles observed on this occasion, and the colour is now lost. Nitre, on the other hand, is known to give out oxygen largely as soon as red-hot; and hence the manganese immediately retakes from this source the oxygen of which the charcoal had deprived it, and resumes its colouring power. The other substances which take away the colour from glass, tinged red with manganese, are all the salts with the basis of sulphuric acid, such as gypsum, sulphat of soda, &c. and also sulphur itself; likewise the oxys of tin and iron, and of some other metals. Nevertheless these substances have this power only when in contact with charcoal. The tinging power of manganese is perfectly destroyed by the addition of arsenic in any form. Thus, a mixture of oxyd of cobalt and oxyd of manganese, in the colouring state, is of a dark purple; but on the addition of any arseniat, or of white arsenic, the manganese is made inactive, and the proper cobalt-blue alone appears. Hence we perceive the necessity, when the red colour of manganese is wanted, to avoid any thing arsenical; and nitre is also generally added to keep the manganese always at the proper state for imparting its colour. The oxyd of manganese is a very powerful flux for all earthy matters; and this, as well as lead, gives a great density to glass. The white oxyd of arsenic is another powerful and cheap flux in the making of glass; but it should be very moderately used; for it takes a longer time to mix intimately with glass, and to allow it to be perfectly clear, than any other of the additions commonly employed. For want of this the glass has a milky hue, which increases with age; and when the arsenic is in excess, the glass becomes gradually soft, and is decomposed. Besides, glass of this kind is unsafe to be used in the form of drinking vessels.

Nitre is also used, in small quantities, in the manufacture of glass, and is designed to answer particular purposes, some of which we have already specified. It not only serves to destroy the strong tinge of yellow which is found in glass, prepared with lead as a flux; but in saline glass, it is requisite, in a smaller proportion, to render it sufficiently transparent, as in the case of looking-glasses, and other kinds of plates. For an account of Mr. Dollond's excellent contrivance for destroying the colours in the object-glasses of telescopes, &c. see **ABERRATION**.

With regard to the several fluxes above enumerated, we may observe, in general, that the more calx of lead, or other metallic earth, enters into the composition of any glass, so much the more fusible, soft, coloured, and dense this glass is, and reciprocally.

The colours given to glass by calces of lead are shades of yellow: on the other hand, glasses that contain only saline fluxes partake of the properties of salts; they are less heavy, less dense, harder, whiter, more brilliant, and more brittle than the former; and glasses, containing both saline and metallic fluxes, do also partake of the properties of both these substances. Glasses too saline are easily susceptible of alteration by the action of air and water; especially those in which alkalies prevail; and these are also liable to be injured



by acids. Those that contain too much borax and arsenic, though at first they appear very beautiful, quickly tarnish, and become opaque when exposed to air. By attending to these properties of different fluxes, phlogistic or saline, the artist may know how to adjust the proportions of these to sand, or powdered flints, for the various kinds of glass.

**GLASS, proportion of ingredients in.** Different kinds of glass require different proportions; nor have these been precisely ascertained. We shall here, and in subsequent articles, state several of the most usual and approved mixtures that have been proposed. When silica is melted with twice its weight, or more, of dry carbonated alkali, either potash or soda, the result is a very soft deliquescent vitreous mass, always more or less opaque, strongly alkaline to the taste, and which, on exposure to moist air, or more speedily in water, totally dissolves into a clear liquor, which is a solution of silica in alkali. When the same alkali is equal to the silica in weight, or does not much exceed it, the glass is now transparent, but it is still soluble in water. It is not till the alkali is diminished to about one-half of the weight of the silica, that the glass becomes perfectly hard and insoluble in any corrosive liquors, (the fluoric acid excepted,) and, in short, acquires the character of a perfect glass. This proportion, therefore, of two parts of sand to one of alkali, is usually the datum on which the doses of the alkalies actually used are regulated. Thus, if common wood ashes (of which the alkaline part is reckoned at no more than 10 per cent.) are employed, 100lbs. of these would require no more than about 20lbs. of sand. If the best Spanish barilla, containing from 45 to 50 per cent. of carbonate of soda, be used, an equal weight of sand may be added; but if purified pearl-ash be taken, it will melt down perfectly twice its own weight of sand. But glasses composed merely of pure alkali and sand, require a very strong fire for their fusion, and are hard, harsh, and difficult to break: they are therefore never used alone. As one-half the weight of the sand is reckoned an abundant allowance of alkali, it follows of course that when litharge, arsenic, borax, or any other fluxes are employed, the quantity of alkali will be proportionally diminished. The following proportions are extracted from Macquer's Chemical Dictionary. If a glass be required that is dense, fusible, and not saline, one part and a half of red lead or litharge may be mixed with one part of sand, and fused together: if equal parts of sand and of calx of lead be employed, a glass somewhat less dense and harder will be produced: if a glass be required of very little density, only saline fluxes must be employed. A glass of this kind may be composed of six parts of salt of tartar, or of potash, or of purified soda, mixed with eight parts of sand or of flints; or of four parts of any of the above-mentioned alkalies, mixed with two parts of nitre or of borax, and eight parts of vitrifiable earth. When a crystal glass is required, which shall be of an intermediate quality betwixt the metallic and saline glasses, it may be made from a mixture of one part of the above mentioned salts, one part of calx of lead, and two parts of sand or other vitrifiable earth. By varying the proportion of these ingredients, many different kinds of glasses may be produced, each of which may be good, if the quantity of each of the fluxes employed be proportionable to its vitrifying power.

**GLASS, instruments for manufacturing.** These are subservient to two different purposes; *viz.* the levigation and mixture of the ingredients, and the fusion or vitrification of them. To the former class belong horse or hand-mills, mortars and pestles, flat stones and mullars, and sieves or sieves. The other sort of utensils are furnaces, with the

proper iron work, pots for containing the composition when put into the fire, and iron instruments for stirring the matter out of one into the other, in case of accidents; and for taking out small portions, in order to judge of the progress of the vitrification, and the qualities of the glass, &c. See the following articles. See also *GLASS-HOUSES*, *FURNACE*, and *GLASS-POTS*.

**GLASS, fusion of.** When the ingredients are selected and duly proportioned, they are first calcined for a longer or shorter time, before they are put into the glass-pot. This operation is called "fritting," and is performed either in small furnaces adjoining to the proper glass-furnace, and heated by the same fuel after its chief force has been spent upon the glass-pots, or else in small furnaces or ovens constructed for this purpose. The uses of fritting are, to expel all moisture from the ingredients, by which the glass-pot would be endangered; to discharge part of the carbonic acid from the alkalies and chalk and thus to moderate the swelling in the glass-pots, and especially to cause an adhesion, or commencement of chemical union, between the alkali and silica, and metallic oxydes. This operation should be performed gradually, and carried to the point of semi-vitrification, in which the materials strongly adhere, and begin to become patty, but are still opaque and not homogeneous. This operation serves also to destroy any carbonaceous matter. When the ingredients are sufficiently fritted, they are thrown with clean iron shovels through the side-opening of the furnace into the glass-pots, the fire having been previously raised to its greatest intensity, to prevent the furnace from being chilled and to save time. The pots are charged by two or three successive portions, the preceding one being thoroughly melted down before another portion is thrown in. When filled, the side-opening is closed up with wet clay, excepting a small hole for examining the work, which closure is pulled down when the glass is well refined and about to be worked off. As soon as the frit begins to feel the action of the fire in the glass-pots, which is immediately raised to its greatest pitch, it sinks down into a soft patty state, increasing in tenacity till the fusion is complete. However, it is still opaque, from the rising of a white porous scum, known by the name of "sandiver," or "glass-gall." This substance appears to be a confused mass, consisting of all those salts contained in common alkalies, which readily melt at somewhat less than a glass-melting heat, and are either naturally soluble in a considerable degree, or have little, if any, affinity for silica, and not uniting in the composition of glass, but being lighter, rise to the top. Another heterogeneous substance, called "sandiver," is sometimes found at the bottom of the pots. This is quite different from the other, and seems to consist of a vitrified mass of arsenic and other impurities. But the scum, or proper "glass-gall," is almost entirely saline. When laded out and cooled, it forms a crumbly mass, sometimes white, at other times brown and fouled, and strongly saline, but not uniform in its composition, being sometimes merely salt, often very bitter, probably as common salt or sulphat of potash predominates. It is so volatile in a strong fire, that it is constantly dispersing from the surface of the glass in a dense vapour, which is first thick and black, afterwards whiter, and which corrodes the top of the crucible in its passage. With long continued fusion it would entirely escape in this state, if it were not scummed off with long ladles, and sold to metal refiners as a powerful flux. Abundance of this glass-gall is attended with one of the greatest inconveniences to the maker of glass, as it requires a considerable continuance of

strong heat to dissipate the whole of it, or otherwise the glass would be full of bubbles, unfound, and having a cloudy gelatinous appearance. It is observed, that glass from potash is more likely to suffer from glass-gall than the soda-glass is, because the potash glasses are harder, and do not run so thin as the other, and the glass-gall from them does not so easily dissipate in the fire.

During this process samples for examination are drawn out of the pots with an iron rod; and the glass gradually becomes more and more flexible, dense, and less brittle, and at last the glass-gall is entirely dissipated. Whilst the heat is continued, the glass which was full of specks and bubbles is refined, and becomes beautifully clear, transparent, and colourless; and this process, which goes on from the cessation of the vapour of the glass-gall and its entire removal to the time when the glass is altogether clear and free from bubbles, is called the "refining." After this the glass is complete; but being too thin for working, it is cooled, by stopping the draught of fire round the pot which contains it, and in cooling it thickens to a fit state for being wrought. For glass that is cast into plates, less cooling is necessary, as it is required to flow very thin and hot. On an average it takes about 48 hours for the fine flint glasses, from the time when the pots are first filled till the glass is ready for working, in which state it is of a very full red colour, and possesses a singular kind of confidence and tenacity. It is just soft enough to yield with ease to any external impression, even to the force of the breath urged pretty strongly in the centre of the glowing mass, and may be bent and shaped in every possible way; and such is its tenacity, that it extends uniformly without any cracks or fissures; but when stretched out to the utmost, it forms a solid string, the diameter of which is constantly decreasing till it separates from the mass in a thin capillary thread. It stiffens as it cools, and becomes perfectly brittle and also transparent. As melted glass adheres very feebly to polished metal, it is very easily wrought with bright iron tools.

**GLASS, working or blowing round.**—Every kind of glass, plate-glass excepted, is formed from a hollow globe that has been produced by blowing. For this purpose the operator takes his blowing-iron, which is a hollow tube, about four or five feet long, and dipping it in the melting-pot, turns it about there till the metal adheres to the iron like some glutinous or clammy juice; he then holds it near the ground, so that the mass is extended by its own weight, and blows strongly into the tube. With his breath thus penetrating into the centre of the red-hot mass, he enlarges it into an uniform hollow globe of the requisite thickness and bulk, keeping the force of his breath upon it for a few seconds till it stiffens by cooling, and thus preventing its sinking by the compression of the denser external air. This globe, adhering by a neck to the iron rod, is formed by the dexterity of the workman, and by a variety of ingenious manœuvres into all the common utensils. As a specimen of his art, we may instance a common tumbler. The hollow globe already mentioned is taken off the iron rod by the following simple process: An assistant dips the end of a short solid iron rod into the glass-pot, and, bringing out at its extremity some of the melted glass, thrusts it immediately against the hollow of the globe at the part directly opposite to the neck, to which it firmly unites, and thus the globe is cemented by the melted glass to the second rod. The workman then wets a small piece of iron with his mouth, and lays it on the neck of the globe, which is extremely hot, and this, in a second or two, cracks it round; so that with a slight pull it comes off and detaches the hollow rod, leaving the globe open at the neck, and transferred to the second rod at the opposite

side. The open globe is again softened by holding it a few seconds over the mouth of the glass-pot, and is cut away from the open end to the form of a cup by iron shears. The operator, when employed in fashioning the globe, usually sits upon a kind of arm-chair, with its arms sloping forwards and covered with a flat smooth iron-plate; and by laying the iron rod straight before him, resting on both the arms of his seat, and twirling it backwards and forwards, the hot glass at the end is made to revolve like clay on a potter's lathe, and thus is opened, widened, or compressed at pleasure by any simple iron instrument that is pressed against it. The globular cup is thus extended easily into a cylinder, or made into the shape of a barrel, if this form be required, and is smoothed up at the edges. In order to separate it from the iron-rod, it is wetted as before at the point of attachment, and the tumbler drops off complete. This last operation leaves that burr or roughness, with sharp fragments, which is seen at the bottom of all glass-vessels, unless it be taken off by polishing. The next operation is that of cooling the vessel very gradually, called "annealing." See *Annealing of GLASS.*

**GLASS, different kinds of.** The manufactured glass now in use may be divided into three general kinds; white transparent glass, coloured glass, and common green or bottle-glass. Of the first kind, there is a great variety; as the flint glass, as it is called with us, and the German crystal glass, which are applied to the same uses; the glass for plates for mirrors or looking-glasses; the glass for windows and other lights; and the glass for phials and small vessels. And these again differ in the substances employed as fluxes in forming them, as well as in the coarseness or fineness of such as are used for their body. The flint and crystal, mirror, and best window glass, not only require such purity in their fluxes, as may render it practicable to free the glass perfectly from all colour; but for the same reason likewise, either the white Lynn sand, calcined flints, or white pebbles, should be used. The others do not demand the same nicety in the choice of the materials; though the second kind of window glass, and the best kind of phial, will not be so clear as they ought, if either too brown sand, or impure salts, be suffered to enter into their composition.

Of coloured glass there is a great variety of sorts, differing in their colour, or other properties, according to the occasions for which they are wanted. The differences in the latter kind depend on the accidental preparation and management of the artists by whom they are manufactured.

**GLASS, Crystal.** Foreigners use this term for our flint glass, and for making it they give the following directions: Take of the whitest tarso, pounded small, and seared as fine as flour, two hundred pounds; of the salt of polverine, a hundred and thirty pounds: mix them together, and put them into the furnace, called the *calcar*, first heating it. For an hour keep a moderate fire, and keep stirring the materials with a proper rake, that they may incorporate and calcine together; then increase the fire for five hours; after which take out the matter; which, being now sufficiently calcined, is called frit. From the *calcar* put the frit in a dry place, and cover it up from the dust for three or four months.

Now, to make the glass, or crystal: Take of this crystal frit, called also *bolito*; set it in pots in the furnace, adding to it a due quantity of manganese: when the two are fused, cast the flux into fair water, to clear it of the salt, called *sandiver*; which would otherwise make the crystal obscure and cloudy. This lotion must be repeated again and again, as often as needful, till the crystal be fully purged; or, this scum may be taken off by means of proper ladles. Then set

it to boil four, five, or six days; which done, see whether it have manganese enough; and if it be yet greenish, add more manganese, at discretion, by little and little at a time, taking care not to overdose it, because the manganese inclines it to a blackish hue. Then let the metal clarify, till it becomes of a clear and shining colour; which done, it is fit to be blown, or formed into vessels at pleasure.

*Glass, Flint*, as it is called in our country, is of the same general kind with that which in other places is called crystal glass. It has this name from being originally made with calcined flints, before the use of the white sand was understood; and retains the name though no flints are now used in the composition of it. This flint glass differs from the other, in having lead for its flux, and white sand for its body; whereas the fluxes used for the crystal glass are salts or arsenic, and the body consists of calcined flints, or white river pebbles, tarso, or such stones. This glass, on account of the quantity of litharge, which enters into its composition, is the heaviest, the most brilliant, the softest and most easy to work, and also the most expensive. It is that fine glass, of which the common and most valuable articles of white glass in domestic or ornamental use are manufactured; and besides, many optical instruments are made of this substance. To the white sand and lead a proper proportion of nitre is added, for the purposes specified in a former part of this general article, and also a small quantity of manganese, and in some works they use a proportionable quantity of arsenic to aid the fluxing ingredients. The most perfect kind of flint glass may be made by fusing with a very strong fire a hundred and twenty pounds of the white sand, fifty pounds of red lead, forty pounds of the best pearl-ashes, twenty pounds of nitre, and five ounces of manganese.

From others we have the following composition for glass of this kind, said to be of the best quality, *viz.* 120 parts of fine clear white sand, 40 of pearl-ashes well purified, 35 of litharge or minium, 13 of nitre, and a small quantity of black oxyd of manganese.

The following composition for a fine crystal glass is given by Løysel; 100 pounds of white sand, 80 to 85 of red oxyd of lead, 35 to 40 of pearl-ash, 2 to 3 of nitre, and one ounce of manganese. The specific gravity of this glass, and of the common London flint-glass, is about 3.2.

Another composition of flint glass, which is said to come nearer to the kind now made, is the following: a hundred and twenty pounds of sand, fifty-four pounds of the best pearl-ashes, thirty-six pounds of red lead, twelve pounds of nitre, and six ounces of manganese. To either of these a pound or two of arsenic may be added, to increase the flux of the composition. A cheaper composition of flint glass may be made with a hundred and twenty pounds of white sand, thirty-five pounds of the best pearl-ashes, forty-pounds of red-lead, thirteen pounds of nitre, six pounds of arsenic, and four ounces of manganese; or, instead of the arsenic, may be substituted fifteen pounds of common salt; but this will be more brittle than the other. The cheapest composition for the worst kind of flint-glass, consists of a hundred and twenty pounds of white sand, thirty pounds of red-lead, twenty pounds of the best pearl-ashes, ten pounds of nitre, fifteen pounds of common salt, and six pounds of arsenic. The best German crystal glass is made of a hundred and twenty pounds of calcined flints, or white sand, seventy pounds of the best pearl-ashes, ten pounds of salt-petre, half a pound of arsenic, and five ounces of manganese. And a cheaper composition is formed of a hundred and twenty pounds of calcined flints, or white sand, forty-six pounds of pearl-ashes, seven pounds of nitre, six pounds of arsenic, and five ounces of manganese.

A glass much harder than any prepared in the common way, may be made by means of borax in the following method: take four ounces of borax, and an ounce of fine lead; reduce both to a subtile powder, and melt them together in a large close crucible set in a wind-furnace, keeping up a strong fire for half an hour; then take out the crucible, and when cold break it, and there will be found at the bottom a pure hard glass, capable of cutting common glass like a diamond. This experiment, daily varied, may lead to several useful improvements in the art of glass, crystals, and factitious gems, and shews an expeditious method of making glass, without any fixed alkali, which has been generally thought an essential ingredient in glass; and it is not yet known whether calcined crystal, or other substances, being added to this salt instead of sand, it might not make a glass approaching to the nature of a diamond. Shaw's Lectures, p. 426.

*Glass, Crown*, is the best sort of window-glass, and differs from the flint-glass in containing no lead, nor any metallic oxyd, except manganese, and sometimes oxyd of cobalt, in minute doses, not as a flux, but for correcting the natural colour. This glass is much harder and harder to the touch than the flint-glass; but when well made it is a very beautiful article. It is compounded of sand, alkali, either potash or soda, the vegetable ashes that contain the alkali, and generally a small portion of lime. A small dose of arsenic is often added to facilitate the fusion. Zaffre, or the oxyd of cobalt, with ground flint, is often used to correct the dingy yellow of the inferior sort of crown-glass, and by adding the blue, natural to glass coloured with this oxyd, to convert the whole into a soft light green. One ounce of zaffre is sufficient for 1000lbs. But when the sand, alkali, and lime are very fine, and no other ingredients are used, no zaffre nor corrective of bad colour is required. A very fine glass of this kind may be made by 200 parts of pretty good soda, 300 of fine sand, 33 of lime, and from 250 to 300 of the ground fragments of glass. We had formerly in London two kinds of crown glass, distinguished by the places where they were wrought; *viz.* 1. *Ratcliff crown glass*, which is the best and clearest, and was first made at the Bear-garden, on the Bank-side, Southwark, but since at Ratcliff: of this there are twenty-four tables to the case, the tables being of a circular form, about three feet six inches in diameter.

2. *Lambeth crown glass*, which is of a darker colour than the former, and more inclining to green. The following composition has been recommended for the best window or crown glass, *viz.* white sand, sixty pounds; of purified pearl-ashes, thirty pounds; of salt-petre, fifteen pounds; of borax, one pound; and of arsenic, half a pound. If the glass should prove yellow, manganese must be added. A cheaper composition for window glass consists of sixty pounds of white sand, twenty-five pounds of unpurified pearl-ashes, ten pounds of common salt, five pounds of nitre, two pounds of arsenic, and one ounce and a half of manganese. The common, or green window glass, is composed of sixty pounds of white sand, thirty pounds of unpurified pearl-ashes, ten pounds of common salt, two pounds of arsenic, and two ounces of manganese. But a cheaper composition for this purpose, consists of a hundred and twenty pounds of the cheapest white sand, thirty pounds of unpurified pearl-ashes, sixty pounds of wood-ashes well burnt and sifted, twenty pounds of common salt, and five pounds of arsenic.

The manufacture of the common window glass, though made by blowing, is conducted differently from that of the flint glass articles; as it is the object to produce a large, flat, very thin plate of glass, which is afterwards cut by the glazier.

glazier's diamond into the requisite shape. Without minutely detailing the several gradations of the process, it may be here mentioned, that the workman takes a very large mass of melted glass on his hollow iron rod, and by rolling it on an iron plate and swinging it backwards and forwards, causes it to lengthen, by its own weight, into a cylinder, which is made hollow and brought to the required thinness, by blowing with a fan of breath, which persons accustomed to the business know how to command. The hollow cylinder is then opened by holding it to the fire, which, by expanding the air confined within it, (the hole of the iron rod being stopped,) bursts it at the weakest part, and when still soft, it is ripped up through its whole length by iron shears, opened out into a flat plate, and finished by annealing as usual.

The large crown glass of Messrs. Hammond and Smith is superior in quality as well as in size to that of any other manufacture. The usual diameter of the tables in other manufactures may be taken at 47 or 48 inches, with an occasional variation in a table of one or two inches: and the largest square which can be cut from these measures about 24 inches by 20, and in some circumstances one inch wider or longer. Whereas the glass of Messrs. Hammond and Smith is 60 inches in diameter, and will admit of being cut into squares of about 33 inches by 23 inches; and a little more or less. This glass is almost free from those specks, wreaths, &c. which discolour other glass, and distort the objects seen through it. It now supplies the place of German sheet glass for prints, large fishes, and exportation to those foreign markets where that glass was formerly in use.

GLASS, *French*, as also called *Normandy glass*, and formerly *Lorraine glass*, because it was made in those provinces: though it has since been made wholly in the nine glass works; five of which were in the forest of Lyons, four in the country of Eu; the last at Beaumont, near Rouen. It is of a thinner kind than our crown glass; and, when laid on a piece of white paper, appears of a dirtyish-green colour. There are but twenty-five tables of this to the case.

GLASS, *German*, is of two kinds, the *white* and the *green*: the first is of a whitish colour, but is subject to those small curved streaks, observed in our Newcastle glass, though free from the spots and blemishes thereof. The green, besides its colour, is liable to the same streaks as the white; but both of them are straighter, and less warped, than our Newcastle glass.

GLASS, *Dutch*, is not much unlike our Newcastle glass, either in colour or price. It is frequently much warped, like that, and the tables are but small.

GLASS, *Newcastle*, is that most used in England. It is of an ash-colour, and much subject to specks, streaks, and other blemishes; and, besides, is frequently warped. Leybourn says, there are forty-five tables to the case, each containing five superficial feet: some say there are but thirty-five tables, and six feet in each table.

GLASS, *Phial*, is a kind of glass betwixt the flint glass and the common bottle, or green glass. The best kind may be prepared with a hundred and twenty pounds of white sand, fifty pounds of unpurified pearl-ashes, ten pounds of common salt, five pounds of arsenic, and five ounces of manganese. The composition for green or common phial glass, consists of a hundred and twenty pounds of the cheapest white sand, eighty pounds of wood ashes, well burnt and sifted, twenty pounds of pearl-ashes, fifteen pounds of common salt, and one pound of arsenic.

GLASS, *common green bottle*, is made almost entirely of sand, lime, and sometimes clay, alkaline ashes of any kind,

as cheapness or convenience direct, and more especially of kelp in this country, of barilla, varec, and the other varieties of soda in France, and of wood ashes in many parts of Germany, and the like. To these ingredients is sometimes added the earth remaining from saline ashes, after the alkali and salts have been extracted by lixiviation, and in England flags from the iron furnaces. Bottle-glass is a very hard well-vitrified glass, which resists the corrosive action of all liquids much better than flint glass. It is used, not only for wine-bottles, but for very large retorts, subliming vessels, and other articles of the chemical apparatus; and it has for this purpose the advantage of bearing as much as a pretty full red heat without melting or sinking down into a shapeless lump, as the lead-glasses would do. The following composition is given by Løysel as a good and cheap material for bottle-glass; viz. 100 parts of common sand, 30 of varec (a kind of coarse kelp made on the western coasts of France), 160 of the lixiviated earth of ashes, 30 of fresh wood-ash, or any other kind of ash, 80 of brick-clay, and any quantity, generally about 100, of broken glass. This composition yields no glass-gall. This kind of glass is formed of sand of any kind, fluxed by the ashes of burnt wood, or of any parts of vegetables; to which may be added the scoriae or clinkers of forges. When the softest sand is used, two hundred pounds of wood-ashes will suffice for a hundred pounds of sand, which are to be ground and mixed together. The composition with the clinkers consists of a hundred and seventy pounds of wood-ashes, a hundred pounds of sand, and fifty pounds of clinkers, or scoriae, which are to be ground and mixed together. If the clinkers cannot be ground, they must be broke into small pieces, and mixed with the other matter without any grinding.

A good bottle-glass, but nearly black and opaque, has been made in France of the decomposed pulverulent basaltic earth found in the vallies of all basaltic countries. In France it abounds in the Vivarais, in Languedoc, and Auvergne. The first glass of this kind appears to have been made in 1780 by a M. Ducros at the suggestion of Chaptal, who simply melted some of this basalt without addition in a glass-pot, and formed of it two very light, black, or rather deep yellow, shining, perfect bottles. In subsequent trials by another artist, a mixture of equal parts of basalt and sand was employed, as preferable to the basalt alone; but notwithstanding a considerable demand for bottles of this material, the manufacture was abandoned for want of uniformity in the ingredients, which made them often fail. The colour of this glass was of a green-olive.

The green colour, transmitted by bottle-glass, when in its perfect state, is owing to the iron contained both in the vegetable ashes and in the sea-sand, which enter into its composition. This glass affords an instance of a semi-pellucid substance, which exhibits a blue colour by incident light, and a yellow or orange colour by that which is transmitted. See Delaval on the cause of the permanent colour of opaque bodies.

GLASS, *Plate*, is the most perfect and beautiful glass, of which all the kinds of mirrors and looking-glasses are composed. The materials of which this kind of glass is made are much the same as those of other works of glass, viz. an alkali salt, and sand.

To prepare the salt, they clean it well of all foreign matters; pound or grind it with a kind of mill, and finally sift it pretty fine.

Pearl-ashes, properly purified, will furnish the alkali salt requisite for this purpose; but it will be necessary to add borax, or common salt, in order to facilitate the fusion, and prevent the glass from stiffening in that degree of heat, in which

which it is to be wrought into plates. For purifying the pearl-ashes, dissolve them in four times their weight of boiling water, in a pot of cast iron, always kept clean from rust. Let the solution be removed into a clean tub, and remain there twenty-four hours, or longer. Having decanted the clear part of the fluid from the dregs or sediment, put it again in the iron pot, and evaporate the water till the salts are left perfectly dry. Preserve them in stone jars, well secured from air and moisture.

Pearl-ashes may also be purified in the highest degree, so as to be proper for the manufacture of the most transparent glass, by pulverizing three pounds of the best pearl-ashes, with six ounces of salt-petre, in a glass or marble mortar, till they are well mixed; and then putting part of the mixture into a large crucible, and exposing it in a furnace to a strong heat. When this is red-hot, throw in the rest gradually; and when the whole is red-hot, pour it out on a moistened stone or marble, and put it into an earthen or clean iron pot, with ten pints of water; heat it over the fire till the salts be entirely melted; let it then stand to cool, and filter it through paper in a pewter cullender. When it is filtered, put the fluid again into the pot, and evaporate the salt to dryness, which will then be as white as snow; the nitre having burnt all the phlogistic matter that remained in the pearl-ashes, after their former calcination.

As to the sand, it is to be sifted and washed, till such time as the water come off very clear; and when it is well dried again, they mix it with the salt, passing the mixture through another sieve. This done, they lay them in the annealing furnace for about two hours; in which time the matter becomes very light and white; in this state they are called *frit*, or *fritta*; and are to be laid up in a dry clean place, to give them time to incorporate. They lie here for at least a year.

When they would employ this frit, they lay it for some hours in the furnace, adding to some the fragments or shards of old and ill made glasses; taking care first to calcine the shards by heating them red-hot in the furnace, and thus casting them into cold water. To the mixture must likewise be added manganese, to promote the fusion and purification.

The best composition for looking-glass plates is said to consist of sixty pounds of white sand cleaned, twenty-five pounds of purified pearl-ashes, fifteen pounds of salt-petre, and seven pounds of borax. If a yellow tinge should affect the glass, a small proportion of manganese, raised with an equal quantity of arsenic, should be added. An ounce of the manganese may be first tried; and if this proves insufficient, the quantity should be increased.

A cheaper composition for looking-glass plate consists of sixty pounds of the white sand, twenty pounds of pearl-ashes, ten pounds of common salt, seven pounds of nitre, two pounds of arsenic, and one pound of borax.

The materials of the finest plate glass, such as that of French manufacture, are white sand, soda, and lime, to which are added manganese and saffre, or any other oxyd of cobalt for particular colouring purposes. The sand is of the finest and whitest kind, which should be previously passed through a wire sieve, moderately close, into water, in which it should be well stirred about and washed. The sharpest grained sand is preferred, and it is found that grains of moderate size melt with the alkali sooner, than the very fine dust or the larger fragments. The alkali is always soda, which is preferable to potash, as glasses made with soda are found to be softer and to flow thinner when hot, and yet to be equally durable when cold. Besides, the

neutral salts with the basis of soda which constitute the glass-gall in this instance, such as the muriat and sulphat of soda, appear to be dissipated more readily by the fire than the corresponding salts of potash. The soda that is used is considerably pure, or such as is separated from the rough ashes of barilla, and other soda plants by lixiviation. Lime adds to the fusibility of the other materials, supplying the use of litharge in the flint-glass; but excess of it would impair the colour and solidity of the glass. About 1-15th of the whole is as much as can properly be used; but some reduce the quantity to 1-24th. The decouring substances are azure, or cobalt blue, and manganese. Besides these, there is always a great quantity of the fragments of glass, collected from the waste of the manufacture, which are made friable by quenching in water when hot, and used in this state together with the fresh materials. As to the quantities and proportions of the ingredients, much latitude is allowed. The following are said to produce a very fine glass; viz. 300lbs. of sand; 200lbs. of soda; 32lbs. of lime; 32 ounces of manganese; three ounces of azure; and 300lbs. of fragments of glass. In the manufactory at St. Gobin secrecy is observed with regard to the materials; but it is affirmed, and with much probability, that borax is used in small quantity.

Of the materials now enumerated the sand, soda, lime, and manganese are first mixed together with more care than for ordinary glass, and they are fritted in small furnaces built for this purpose, the heat being gradually raised to a full red-white, and then kept with frequent stirring till the materials undergo no farther change, nor yield any kind of vapour. The azure and glass fragments being already in a state of perfect vitrification are not added till just at the end of the process, which lasts about six hours. When the materials are thus prepared, they are fit for plate-glass, to be formed either by blowing or casting. The largest glasses at St. Gobin are run; the middle-sized and small ones are blown.

*Blowing looking-glass plates.* The work-houses, furnace, &c. used in the making of this kind of plate-glass, are the same, except that they are smaller, and that the carquoilles are disposed in a large covered gallery, over-against the furnace, as those in the following article, to which the reader is referred.

After the materials are vitrified by the heat of the fire, and the glass is sufficiently refined, the workman dips in his blowing iron, six feet long, and two inches in diameter, sharpened at the end, which is put in the mouth, and widened at the other, that the matter may adhere to it. By this means he takes up a small ball of matter, which sticks to the end of the tube by constantly turning it. He then blows into the tube, that the air may swell the unswelled ball; and carrying it over a bucket of water, which is placed on a support at the height of about four feet, he sprinkles the end of the tube to which the matter adheres, with water, still turning it, that by this cooling, the matter may coalesce with the tube, and be fit for sustaining a greater weight. He dips the tube again into the same pot, and proceeds as before; and dipping it in the pot a third time, he takes it out, loaded with matter, in the shape of a pear, about ten inches in diameter, and a foot long, and cools it at the bucket; at the same time blowing into the tube, and, with the assistance of a labourer, giving it a balancing motion, he causes the matter to lengthen; which, by repeating this operation several times, assumes the form of a cylinder, terminating like a ball at the bottom, and in a point at the top. The assistant is then placed on a stool three feet and a half high; and on this stool there are two

upright pieces of timber, with a cross beam of the same, for supporting the glass and tube, which are kept in an oblique position by the assistant, that the master workman may with a puncheon set in a wooden handle, and with a mallet make a hole in the mass; this hole is drilled at the centre of the ball that terminates the cylinder, and is about an inch in diameter. When the glass is pierced, the defects of it are perceived; if it is tolerably perfect, the workman lays the tube horizontally on a little iron tressel, placed on the support of the aperture of the furnace. Having exposed it to the heat for about half a quarter of an hour, he takes it away, and with a pair of long and broad shears, extremely sharp at the end, widens the glass, by insinuating the shears into the hole made with the puncheon, whilst the assistant, mounted on the stool, turns it round, till, at last, the opening is so large as to make a perfect cylinder at bottom. When this is done, the workman lays his glass upon the tressel, at the mouth of the furnace, to heat it: he then gives it to his assistant on the stool, and with large shears cuts the mass of matter up to half its height. There is at the mouth of the furnace an iron tool, called *pontil*, which is now heating, that it may unite and coalesce with the glass just cut, and perform the office which the tube did before it was separated from the glass. This *pontil* is a piece of iron, six feet long, and in the form of a cane or tube, having at the end of it a small iron bar, a foot long, laid equally upon the long one, and making with it a T. This little bar is full of the matter of the glass, about four inches thick. This red-hot *pontil* is presented to the diameter of the glass, which coalesces immediately with the matter round the *pontil*, so as to support the glass for the following operation. When this is done, they separate the tube from the glass, by striking a few blows with a chisel upon the end of the tube, which has been cooled; so that the glass breaks directly, and makes this separation, the tube being discharged of the glass now adhering to the *pontil*. They next present to the furnace the *pontil* of the glass, laying it on the tressel to heat, and redden the end of that glass, that the workman may open it with his shears, as he has already opened one end of it, to complete the cylinder; the assistant holding it on his stool as before. For the last time, they put the *pontil* on the tressel, that the glass may become red-hot, and the workman cuts it quite open with his shears, right over-against the fore-mentioned cut; this he does as before, taking care that both cuts are in the same line. In the mean time, the man who looks after the carquaisse, comes to receive the glass upon an iron shovel, two feet and a half long without the handle, and two feet wide, with a small border of an inch and a half to the right and left, and towards the handle of the shovel. Upon this the glass is laid, flattening it a little with a small stick a foot and a half long, so that the cut of the glass is turned upwards. They separate the glass from the *pontil*, by striking a few gentle blows between the two with a chisel. The glass is then removed to the mouth of the hot carquaisse, where it becomes red-hot gradually; the workman, with an iron tool, six feet long, and widened at the end in form of a club at cards, four inches long, and two inches wide on each side, very flat, and not half an inch thick, gradually lifts up the cut part of the glass, to unfold it out of its form of a flattened cylinder, and render it smooth, by turning it down upon the hearth of the carquaisse. The tool, already described, being insinuated within the cylinder, performs this operation, by being pushed hard against all the parts of the glass. When the glass is thus made quite smooth, it is pushed to the bottom of the carquaisse, or annealing furnace, with a small iron raker; and ranged there with a little iron hook. When

the carquaisse is full, it is flopped and cemented as in the case of run glasses, and the glass remains there for a fortnight to be annealed; after which time, they are taken out to be polished. A workman can make but one glass in an hour, and he works and rests for six hours alternately.

It may be observed, that looking-glasses, thus blown, should never be above forty-five, or at most fifty inches long, and of a breadth proportionable. Those exceeding these dimensions, as we frequently find among the Venice glasses, cannot have the thickness sufficient to bear the grinding; and, besides, are subject to warp, which prevents them from regularly reflecting objects. Whereas plates as large as nine feet in length and proportionally wide, have been manufactured by calling.

*Casting or running large Looking-glass plates.* This art, as we have observed in the *History of Glass*, is of French invention. It is owing to the Sieur Abraham Thevart, who first proposed it to the court of France, in 1688.

It is performed much like the casting of sheet-lead among the plumbers; and by means hereof we are not only enabled to make glasses of more than double the dimensions of any made by the Venetian way of blowing; but also to cast all kinds of borders, mouldings, &c.

The furnaces for melting the materials of this manufacture are of large size, being about 18 feet long and 15 wide; and those for annealing the glasses, when formed, are much more so. Round a melting-furnace, there are at least twenty-four annealing furnaces or ovens; each from twenty to twenty-five feet long; they are called carquaisse; each carquaisse has two thirds, or apertures, to put in wood, and two chimnies. Add, that beside the annealing furnaces, &c. there are others for making of frit, and calcining old pieces of glass.

All these furnaces are covered over with a large shed; under which are like wise forges, and work-houses for smiths, carpenters, &c. continually employed in repairing and keeping up the machines, furnaces, &c. as also lodges, and apartments for these, and the other workmen, employed about the glass, and keeping up a perpetual fire in the great furnace; so that the glass-house, as that in the castle of St. Goban, in the forest of Fere, in the Soissonois, appears more like a little city, than a manufactory.

The inside of furnaces is formed of a sort of baked earth, or refractory clay, proper to sustain the action of fire; and the same earth serves also for melting-pots, cisterns, &c. The furnaces seldom last above three years; after which they are to be rebuilt, from bottom to top; and to keep them good, even for that time, the inside must be refitted every six months, at which time the fire is extinguished. The melting-pots are as big as wine hogheads, about three feet in height, and in diameter; and contain above two thousand weight of metal. They are in the form of an inverted and truncated cone. The cisterns, or pans, called "cuvettes," are much smaller, being about thirty-six inches long, eighteen inches wide, and as many deep; and serve for the conveyance of liquid glass, which is drawn out of the pots to the casting tables. They do not contain much more than a sixth, or when large plates are cast, a third of the pots.

When the furnace is in condition to receive the pots and cisterns, they heat it red-hot, which requires fifty cords, or a hundred cart-loads of wood. That kind of wood which emits the largest and brightest flame, without much resinous smoke, is preferred. This done, they fill the pots with the materials, or soda and sand, which is done at several times, to facilitate the fusion. When the matter is sufficiently vitrified, refined, and settled, which usually happens in thirty-



thirty-six hours, they fill the cisterns, which are in the same furnace, and which are left there about six hours longer, till such time as they appear all white through the excellent heat.

To get the cisterns with the metal out of the furnace, they make use of a large iron chain which opens and shuts with hooks and eyes. From the middle of this, on each side, arise two massive iron pins, by which, with the assistance of pulleys, the cisterns are raised upon a kind of carriage of a proper height; and thus conducted to the table where the glass is to be run. The cistern is then raised above the tables with an engine, in form of a crane, by means of two iron bars, so contrived as to throw the cistern into an inclined position, which discharges a torrent of matter, all on fire, with which the table prepared for this purpose is presently covered.

The table on which the glass is to be run, is of smooth thick copper-plate, about ten feet long, and six feet broad. It is supported on a wooden frame, with truckles, for the convenience of removing from one carquaisse, or annealing furnace, to another, in proportion as they are filled.

Or, when each pot has a calling table, it is strongly supported by masonry, and contiguous to each table on the same level are the annealing ovens, upon which, being flat, the glass, when cast and sufficiently cooled, may be slid from off the copper-table without much difficulty. The tops of the flat ovens and the tables are on a level with the corresponding opening of the furnace, whence the cuvettes or cisterns are withdrawn. When the glass is melted and fined in the manner already stated under the article *Flint Glass*, the cuvette or cistern, previously made hot in the furnace, is filled out of the pot with a copper ladle, about ten inches in diameter, fixed to an iron handle seven feet long, properly supported on an iron stay by two workmen; and after remaining in the furnace for some hours, till the samples taken out for trial appear to be quite clear and limpid, the door of the furnace is opened, and the cuvette is pulled out and removed to the side of the copper table. It is then scummed with an instrument consisting of a copper blade set in iron, and hoisted for the discharge of its contents on the table, in the manner already mentioned.

To form the thickness of a glass, and to make the surface smooth and even, there are two iron rulers or rims, placed round the edge of the table; and on these rest the two extremes of a kind of roller, or hollow heavy cylinder of copper, turned after being cast, and about 500 pounds in weight, which serves to drive the liquid matter before it to the end of the table, or mould. The iron rulers being moveable, and capable of being set closer, or farther apart, at pleasure, determine the width of the glasses, and retain the matter, that it does not run off at the edges. The waste glass, if any, falls into a vessel of water, and is reserved for the next melting.

As soon as the matter is arrived at the end of the table, and the glass is come to a consistence, examined by the directors of the manufacture, and approved, they shove it off into the annealing furnace, with an iron raker, as wide as the table, that has a handle two fathoms long; being assisted by workmen on the other side of the carquaisse, who, with iron hooks, pull the glass to them, and range it in the carquaisse, which holds six large glasses.

What is most surprising throughout the whole of this operation, is the quickness and address wherewith such massy cisterns, filled with a flaming matter, are taken out of the furnace, conveyed to the table, and poured on it, the glass spread, &c. The whole is inconceivable to such as

have not been eye-witnesses of that surprising manufacture.

As fast as the cisterns are emptied, they carry them back to the furnace and take fresh ones, which they empty as before. This they continue to do, so long as there are any full cisterns; laying as many plates in each carquaisse as it will hold, and stopping them up with doors of baked earth, or clay, and every chink with cement, as soon as they are full, to let them anneal, and cool again, which requires about fourteen days.

The first running being dispatched, they prepare another, by filling the cisterns anew, from the matter in the pots; and after the second, a third, and even a fourth time, till the melting pots are quite empty.

The cisterns at each running should remain at least six hours in the furnace to whiten; and when the first annealing furnace is full, the calling table is to be carried to another. It need not here be observed, that the carquaisse, or annealing furnaces, must first have been heated to the degree proper for them. It may be observed, that the oven full, or the quantity of matter commonly prepared, supplies the running of eighteen glasses, which is performed in eighteen hours, being an hour for each glass. The workmen work six hours, and are then relieved by others.

When the pots are emptied, they take them out, as well as the cisterns, to scrape off what glass remains, which otherwise would grow green by continuance of fire, and spoil the glasses. They are not filled again in less than thirty-six hours, so that they put the matter into the furnace, and begin to run it every fifty-four hours.

The manner of heating the large furnaces is singular enough; the two tilors, or persons employed for that purpose, in their shirts, run round the furnace without making the least stop, with a speed scarce inferior to that of the lightest courier: as they go along, they take two billets, or pieces of wood, which are cut for the purpose; these they throw into the first tilart; and continuing their course do the same for the second. This they hold without interruption for six hours successively; after which they are relieved by others, &c. It is surprising that two such small pieces of wood, and which are consumed in an instant, should keep the furnace to the proper degree of heat; which is such, that a large bar of iron, laid at one of the mouths of the furnace, becomes red-hot in less than half a minute.

It is computed, that a furnace, before it be fit to run glass, costs above three thousand five hundred pounds; that at least six months are required for the building it anew, and three months for the refitting it; and that when a pot of matter burns in the furnace, the loss of matter and time amounts to above two hundred and fifty pounds.

The glass, when taken out of the melting-furnace, needs nothing farther but to be ground, polished, and solated. But before these operations are performed, they cut and square the edges of the plates; which is performed with a rough diamond, passed along the surface of the glass, upon a square ruler, like that of the glaziers, and made to cut into the substance of the glass to a certain depth. This cut is then opened by gently knocking with a small hammer on the under side of the glass, just under it; by which means the piece comes off, and the roughness of the edges are removed by pincers. The plates are then used by for *calling*,  
*calling*.

*polishing*, and *silvering*; which see respectively. See also **LOOKING-GLASS.**

**GLASS, Annealing or Nealing of.** The operation of annealing of glass is performed in a peculiar furnace called the *leer*, which consists of two parts, the *tower* and *leer*. The vessels, as soon as made, are placed by the workmen on the floor of the former to anneal: which done, they are drawn slowly in a sort of pan, called *frackes*, by an operator called the *farole-man*, all along the latter, the space of five or six yards, to give them time to cool gradually; so that when they reach the mouth of it, they are found quite cold. Merret, Not. to Neri, p. 243, seq.

This annealing is generally performed in a hot chamber, built for the purpose, at the top of the glass-house, above the crucibles, and a little below the chimney. Without this precaution, the glass would be liable to fly and break, by the least change of heat and cold, by the smallest scratch, and sometimes without any apparent external cause. The hard glasses, and those especially that are made with alkali and earths, require much more annealing than the softer and more fusible glasses, containing in their composition much litharge.

The particles of glass by annealing are supposed to lose part of their springiness, and their brittleness at the same time. A gradual heating or cooling of glass, according to Dr. Hook, anneals or reduces its parts to a texture more loose, and easy to be broke; but withal more flexible than before. And hence in some measure the phenomena of glass-drops.

Some of the phenomena depending on the fragility of unannealed glass deserve the attention of the curious. Those of the lachrymæ, or glass-drops, were among the first taken notice of; and it has also been observed, that hollow bells made of unannealed glass, with a small hole in them, will fly to pieces by the heat of the hand only, if the hole by which the internal and external air communicate be stopped with a finger. Phil. Transf. N<sup>o</sup> 477. § 3. See RUPERT'S Drops.

But lately some vessels made of such unannealed glass have been discovered, which have the remarkable property of resisting very hard strokes given from without, though they shiver to pieces by the shocks received from the fall of very light and minute bodies dropped into their cavities. Of this kind is the "Bologna phial." These glasses may be made of any shape; all that needs be observed in making them, is to take care that their bottoms may be thicker than their sides. The thicker the bottom is, the easier do the glasses break. One whose bottom is three fingers breadth in thickness, lies with as much ease at least as the thinnest glass. Some of these vessels have been tried with strokes of a mallet sufficient to drive a nail into wood tolerably hard, and have resisted fracture. They also resist the shock of several heavy bodies let fall into their cavities, from the height of two or three feet. For instance, musket-balls, pieces of iron, or other metal; pyrites, jasper, wood, bone, &c. but this is not surprising, as other glasses of the same size do the same. But the wonder is, that taking a shiver of flint of the size of a small pea, and letting it fall into the glass only from the height of three inches, in about two seconds the glass flies, and sometimes in the very moment of the shock; nay, a bit of flint, no larger than a grain, dropt into several glasses successively, though it did not immediately break them, yet they all flew, being set by, in less than three quarters of an hour. Phil. Transf. ibid. p. 509.

Some other bodies produce a like effect with flint: for instance, sapphire, porcelain, diamonds, hard tempered steel,

as also marbles, such as boys play with; to which add pearls from the animal kingdom.

The experiment succeeded also when the glasses were held in the hand, rested on a pillow, put in water, or filled with water. It is also remarkable, that the glasses broke upon their bottoms being slightly rubbed with the finger, though some of them did not fly till half an hour after the rubbing.

If the glasses be every where extremely thin, they do not break in these circumstances.

Some have pretended to account for these phenomena, by saying, that the bodies dropped into these vessels cause a concussion, that is stronger than the cohesion of the parts of the glass, and that consequently a rupture of the same must ensue. But why does not a ball of gold, silver, iron, copper, or several other bodies, even a thousand times heavier than a shiver of flint, equally cause this concussion, and break the glasses?

Mr. Euler has endeavoured to account for these appearances from his Principles of Percussion. He thinks this experiment entirely overthrows the opinion of those who measure the force of percussion by the *vis viva*; and he thinks the principles he has established give a clear solution of this phenomenon. According to these principles, the extreme hardness of the flint, and also its angular figure, which makes the space of contact with the glass vessel extremely small, ought to cause an impression on the glass vastly greater than lead or any other metal; and this may account for the flint's breaking the vessel, though the bullet, even falling from a considerable height, does no damage. Mem. Acad. Berlin, 1745, p. 47.

Hollow cups, made of the green bottle-glass, some of them three inches thick at bottom, were instantly broken, by a shiver of flint weighing about two grains, though they had resisted the shock of a musket ball from the height of three feet. Phil. Transf. ibid. p. 515.

"The precise mechanical cause of this disposition to crack in unannealed glass, is very difficult to explain," says Aikin (Dict.), "but generally speaking, it is supposed to be the forcible contraction of the outer part by sudden cooling, whilst the inner portion is still soft and half-fluid, so that the whole fixes with a permanent strain or inequality of pressure of one part upon the other; and as glass is extremely elastic, though brittle, any force which tears a slender portion, however small, of the tense part, communicates a strong and sudden impulse over the whole mass." "This most singular phenomenon," (of the Rupert's drop) says the same ingenious chemist, in consequence of his own experiments, "is obviously owing to some permanent and very strong inequality of pressure, for when they are heated so red, as to be soft and merely let to cool of themselves, this property of bursting is entirely lost, and, at the same time, the specific gravity of the drop is increased. The peculiar brittleness of the Bologna phial is also removed by again heating and cooling slowly." The common window-glass, when badly annealed, is cut by the diamond with difficulty, and the cut often lies in a direction different from what was intended, or the glass entirely breaks.

Among other more common defects of glass, we may mention its liability to be acted upon by corrosive liquors, as is the case when too much saline flux has been used. As impenetrable as glass is to the common menstrua, we find it eaten by the air in length of time, when exposed in old windows; but the effects of its being kept in a subterraneous place are much more strange. Borrichius tells us, that at

the time when he was at Rome, there was dug up a whole house from under the kitchen garden of a citizen. The house had been buried there ten ages, and there were found in it several glass urns, or lacrymatories. The glass of these had no holes made in it, as our old glass in chamber-windows has, but still retained its smooth surface and transparency; but it was split into a vast number of thin laminae, which were as pellucid and fine as Muscovy glass; and in some places were tinged with all the beautiful colours that art could have given. We are not acquainted perfectly with the ancient way of working their glass; but it is not probable there could be any thing particular in the formation of the vessel, to determine it to split thus into flakes; but that glass of the same kind, in any form, would have done the same. Borrich. de Ortu Chemic.

There are other visible imperfections in glass, materially injuring its soundness and beauty, and enumerated by Aikin (Dict. art. *Glass*) under the denominations of *striae*, *threads*, *tears*, and *knots*. The former are undulating waves in the glass, arising from the imperfect mixture of the materials, and their different specific gravities. Accordingly, we may observe, that the most transparent glass is subject to bubbles and veins, the methods of preventing which are yet little known; and this is an inconvenience by which Mr. Dollond's excellent discovery is affected; for the flint-glass which he uses is peculiarly subject to small veins, that disturb the rays in their passage, and render the vision confused. This effect is owing to the density of these veins being greater than that of the rest of the glass, as appears from their image received on white paper, when the glass is held between the paper and a candle, or other luminous object: for this image of a vein, thus received, is a line brighter than the rest of the image of the glass, and this bright line is defined by a dark edge on each side. But the bright line evidently shews a convergency of rays, which can only be effected by the veins being denser than the medium in which they are placed. The reason why flint glass is more subject to veins than other glass is, says the translator of Macquer's Chemical Dictionary, because it is composed of materials of more different densities.

Mr. Macquer, with a view of improving the manufacture of this glass, proposes to facilitate the union of the calx of lead and sand, of which it is composed, by depriving the calx of lead, as much as possible, of its phlogiston, which may be done by combining the vitriolic acid with minium, or red-lead, and exposing this composition to the operation of fire, to disengage it from the acid; and also by giving these two substances the greatest possible degrees of fluidity and mobility, which may be done by mixing with the composition of them a considerable quantity of solvents. Hill. Acad. Scienc. for 1773.

*Threads* in glass, are those streaky filaments which arise from the vitrification of the clay; being generally green, and rendering the glass more liable to crack at these parts. But one of the worst defects (says Aikin, *ubi supra*), is "*tears*, or drops of vitrified clay falling down from the furnace into the pots, and entangled with the glass. Articles made of glass with this defect, are always very brittle, and generally break of themselves by slight changes of heat and cold." Small bubbles appear in glass not sufficiently refined by a continuance of the melting heat; and these may be owing to a deficiency of flux, so that the glass is less fusible, and the bubbles cannot easily be disengaged. "Hence," says the author now cited, "the soft fusible glasses with much lead are much less liable to this fault than the hard, green bottle-glass, which is made only of alkali

and earth." The *lumps* in glass, arise either from a portion of sand that has escaped vitrification, and remains entangled in the glass, or from a remaining quantity of glass-salt; or from bits of the crucible which may be accidentally knocked off by the iron instruments used in the working.

*GLASS of Antimony.* See *Oxide of ANTIMONY* and *VITRUM Antimonii vitratum*.

*GLASS, Axungia of.* See *ANUNGA*, *SANIVEL*, and *GLASS, supra*.

*GLASS of Borax.* See *BORAX*.

*GLASS, Colouring of, to imitate gems.* See *GEM*.

*GLASS, Gold-coloured.* This kind of glass may be made by taking ten pounds of either of the compositions for hard glass, omitting the salt-petre; and for every pound adding an ounce of calcined borax; or, if this quantity does not render the glass sufficiently fusible, two ounces; ten ounces of red tartar, of the deepest colour, two ounces of manganese, and two drams of charcoal of sawdust, or any other soft kind. Precipitate of silver baked on glass will stain it yellow, and likewise give a yellow colour on being mixed with and melted with forty or fifty times their weight of vitreous compositions; the precipitate from aqua-fortis by fixed alkali seems to answer best. Yellow glasses may also be obtained with certain preparations of iron, particularly with Prussian blue. But Dr. Lewis observes, that the colour does not constantly succeed, nor approach to the high yellow of gold, with silver or with iron. The most successful of gold which he has been able to produce, have been effected with antimony and lead. Equal parts of the glass of antimony, of flint calcined and powdered, and of minium, formed a glass of a high yellow; and with two parts of glass of antimony, two of minium, and three of powdered frit, the colour approached still more to that of gold. The last composition exhibited a multitude of small sparkles interspersed through its whole substance, which gave it a beautiful appearance in the mass, but were really imperfections, owing to air-bubbles.

Neri directs, for a gold-yellow colour, one part of red tartar, and the same quantity of manganese, to be mixed with a hundred parts of frit. But Kunkel observes, that these portions are faulty; that one part, or one and a quarter of manganese, is sufficient for a hundred of frit; but that six parts of tartar are hardly enough, unless the tartar is of a dark red colour, almost blackish; and that he found it expedient to add to the tartar about a fourth of its weight of powdered charcoal. He adds, that the glass swells up very much in melting, and that it must be left unstirred and worked as it stands in fusion. Mr. Samuel More, in repeating and varying this process, in order to render the colour more perfect, found that the manganese is entirely essential to the gold colour, and that the tartar is no otherwise of use, than in virtue of the coaly matter, to which it is in part reduced by the fire; the phlogiston or inflammable part of the coal appearing in several experiments to be the direct tinging substance. Mr. Pott also, in his *Neue Wichtige Physikalisch-Chymische Materien*, &c. printed in 1762, observes, that common coals give a yellow colour to glass; that different coaly matters differ in their tinging power; that caput mortuum of foot and lamp-black answer better than common charcoal; and that the sparkling coal which remains in the retort after the rectification of the thick empyreumatic animal oils, is one of the most active of these preparations. This preparation, he says, powdered, and then burnt again a little in a close vessel, is excellent for tinging glass, and gives yellow, brown, reddish, or blackish colour, according to its quantity: but the frit must not be very

hard of fusion; for, in this case, the strong fire will destroy the colouring substance before the glass melts, and he has found the following compositions to be nearly the best; viz. sand two parts, alkali three parts; or sand two, alkali three, calcined borax one; or sand two, alkali two, calcined borax one: and though salt-petre is hardly used at all, or very sparingly, for yellow glasses, as it too much volatilizes the colouring substance; yet here for the most part a certain proportion of it, easily determined by trial, is very necessary; for without it, the concentrated colouring matter is apt to make the glass too dark, and even of an opaque pitchy blackness. It does not certainly appear that there is any material diversity in the effects of different coals; the difference being probably owing to the different quantities of the inflammable matter which they contain; so that a little more shall be required of one kind than of another, for producing the same degree of colour in the glass. Nor does the softness or fusibility of the salt appear to be in any respect necessary.

Gold-coloured spangles may be diffused through the substance of glass, by mixing the yellow tales with powdered glass, and bringing the mixture into fusion. See Lewis's Com. Phil. Techn. p. 223, 626, &c.

GLASS for counterfeiting lapis lazuli. See LAPIS LAZULI.

GLASS resembling opal. See OPAL and GEMS.

GLASS, Ruby. The way to give the true fine red of the ruby, with a fair transparency, to glass, is as follows. Calcine in earthen vessels gold dissolved in aqua regia, the menstruum being evaporated by distillation, more aqua regia added, and the abstraction repeated five or six times, till it becomes a red powder. This operation will require many days in a hot furnace; when the powder is of a proper colour, take it out; and when it is to be used, melt the finest crystal glass, and purify it, by often casting it into water; and then add, by small quantities, enough of this red powder to give it the true colour of a ruby, with an elegant and perfect transparency. Neri. See GEMS.

The process of tinging glass and enamels by preparations of gold, were first attempted about the beginning of the 17th century. Libavius, in one of his tracts, entitled Alchymia, printed in 1626, conjectures that the colour of the ruby proceeds from gold, and that gold dissolved, and brought to redness, might be made to communicate a like colour to facitious gems and glass. On this principal Neri, in his "Art of Glass," dated 1611, gives the process above recited. Glauber, in 1648, published a method of producing a red colour by gold, in a matter which is of the vitreous kind, though not perfect glass. For this purpose he ground powdered flint or sand with four times its weight of fixed alkaline salt; this mixture melts in a moderately strong fire, and when cold looks like glass, but exposed to the air runs into a liquid state. On adding this liquor to solution of gold in aqua regia, the gold and flint precipitate together in form of a yellow powder, which by calcination becomes purple; by mixing this powder with three or four times its weight of the alkaline solution of flint, drying the mixture, and melting it in a strong fire for an hour, a mass is obtained, of a transparent ruby colour, and of a vitreous appearance, which nevertheless is soluble in water, or by the moisture of the air, on account of the redundancy of the salt. The honourable Mr. Boyle, in a work published in 1680, mentions an experiment, in which a like colour was introduced into glass without fusion; for, having kept a mixture of gold and mercury in digestion for some months, the fire was at last immoderately increased, so that the glass burst with a violent explosion; and the lower part of the glass was found tinged throughout

of a transparent red colour, hardly to be equalled by that of rubies. See Porosity of Bodies, in Shaw's Abridgment of Boyle's Works, vol. 1. p. 459; and Appendix to the Sceptical Chemist.

About the same time Cassius is said to have discovered the precipitation of gold by tin, and that glass might be tinged of a ruby colour by melting it with this precipitate: though he does not appear, says Dr. Lewis, from his treatise De Auro, to have been the discoverer of either. He describes the preparation of the precipitate and its use, but gives no account of the manner of employing it; only that he says, one dram of gold, duly prepared, will tinge ten pounds of glass. See GOLD precipitate with tin.

This process was soon after brought to perfection by Kunckel; who says, that one part of the precipitate is sufficient to give a ruby colour to 1280 parts of glass, and a sensible redness to upwards of 1900 parts; but that the success is by no means constant. Kunckel also mentions a purple-gold powder, resembling that of Neri, which he obtained by insipidating solution of gold to dryness, abstracting from it fresh aqua regia three or four times, till the matter appears like oil; then precipitating with strong alkaline ley, and washing the precipitate with water. By dissolving this powder in spirit of salt, and precipitating it again, it becomes, he says, extremely fair; and in this state he directs it to be mixed with a due proportion of Venice glass.

Orschal in his treatise entitled Sol sine Vesle, gives the following process for producing a very fine ruby. He directs the purple precipitate, made by tin, to be ground with six times its quantity of Venice glass into a very fine powder, and this compound to be very carefully mingled with the frit or vitreous composition to be tinged. His frit consists of equal parts of borax, nitre, and fixed alkaline salt, and four times as much calcined flint as of each of the salts; but he gives no directions as to the proportion of the gold precipitate, or mode of fusion. Hellot describes a preparation, which mixed with Venice glass, was found to give a beautiful purple enamel. This preparation consists of equal parts of solution of gold, and of solution of zinc in aqua regia, mixed together with the addition of a volatile salt prepared from sal ammoniac, in quicklime, in sufficient quantity to precipitate the two metals. The precipitate is then gradually heated, till it acquires a violet colour. However, though a purple or red colour, approaching to that of ruby, may, by the methods above recited, be baked on glass or enamels, and introduced into the mass by fusion, the way of equally diffusing such a colour through a quantity of fluid glass is still, says Dr. Lewis, a secret. The following process for making the ruby glass was communicated to Dr. Lewis by an artist, who ascribed it to Kunckel. The gold is directed to be dissolved in a mixture of one part of spirit of salt, and three of aqua-fortis, and the tin in a mixture of one part of the former of these acids with two of the latter. The solution of gold being properly diluted with water (see GOLD precipitate, &c.) the solution of tin is added, and the mixture left to stand till the purple matter has settled to the bottom. The colourless liquor is then poured off, and the purple sediment, while moist and not very thick, is thoroughly mixed with powdered flint or sand. This mixture is well ground with powdered nitre, tartar, borax, and arsenic, and the compound melted with a suitable fire. The proportions of the ingredients are 2560 parts of sand, 384 of nitre, 240 of tartar, 240 of borax, 28 of arsenic, 5 of tin, and 5 of gold. Lewis's Com. Phil. Techn. p. 171. 621, &c.

GLASS, white-opaque, and semi-transparent, may be made of ten pounds of either of the compositions for hard glass, and

one pound of well calcined horn, ivory, or bone; or an opaque whiteness may be given to glass, by adding one pound of very white arsenic to ten pounds of flint glass. Let them be well powdered and mixed, by grinding them together; and then fused with a moderate heat, till they are thoroughly incorporated. A glass of this kind is made in large quantities at a manufacture near London, and used not only for different kinds of vessels, but as a white ground for enamel in dial-plates and snuff-boxes, which do not require finishing with much fire, because it becomes very white and fusible with a moderate heat.

**GLASS, Yellow.** See **Golden-coloured GLASS.**

**GLASS-balls,** which are circular or otherwise shaped hollow vessels of glass, may be coloured within, so as to imitate the semi-pellucid gems. The method of doing it is this: make a strong solution of ichthyocolla, or isinglass, in common water, by boiling; pour a quantity of this while warm into the hollow of a white glass vessel; shake it thoroughly about, that all the sides may be wetted, and then pour off the rest of the moisture. Immediately after this, throw in red lead, shake it and turn it about, throw it into many places with a tube, and the moisture will make it flick and run in waves and pretty figures. Then throw in some of the painter's blue finalt, and make it run in waves in the ball as the red-lead; then do the same with verdigris, next with orpiment, then with red lake, all well ground; always casting in the colours in different places, and turning the glass, that the moisture within may run them into the waves. Then take fine plaster of Paris, and put a quantity of it into the ball; shake it also nimbly about; this will every where flick firmly to the glass, and give it a strong inner coat, keeping all the colours on very fairly and strongly.

These are set on frames of carved wood, and much esteemed as ornaments in many places. Neri.

**GLASS-drops** See **RUPERT'S drops.**

**GLASS, Foliating of.** See **FOLIATING and LOOKING-GLASS.**

**GLASS-gall, or sandiver,** is the scum of the glass pots, which arises during the vitrification of the frit. See **GLASS,** *supra.*

**GLASS, gilding of.** See **GILDING of enamel and glass.**

**GLASS, grinding of.** See **GRINDING.**

**GLASS-house Furnace,** is the place in which the ingredients or materials of glass are fused and vitrified. There are three kinds of furnaces used in the glass-works. The *first*, called the "calcar," serves for preparing or calcining the frit. It is made like an oven, 10 feet long, seven broad, and two deep. The fuel, which is sea-coal, is put in a trench on one side of the furnace; and the flame reverberates from the roof back upon the frit. The coals burn in an iron grate, and the ashes fall thence into holes underneath.

The *second* is the "working furnace," in which the ingredients are melted, and the glass is made. Its figure is round, resembling a dome, three yards in diameter, and two high, supported on arches, beneath which is a large space for a brick and copious draught of cold air from without: round the inside there are arranged eight or more pots, and on each piling-pots, every where closed except at one side opening, which communicates with a small recess formed by the alternate projections of the masonry and flues of the oven or kiln, in which recess the workmen stand. The furnace has two partitions; the lower, separating the pots from the fire-place, has a circular hole in the centre covered with a grate, through which the flame passes from the fire-place into the furnace, being afterwards reverberated from the arched sides and roof to the melting-pots, and passing out with the smoke through the top of the dome, which is lengthened into a chimney for

the space of a few feet. The *second*, and the *third*, this from the lower or annealing furnace; through the boccas, or working holes, when there are more than one, the metal is taken out of the pots, and the pots put into the furnace: these boccas are stopped with moveable cover, made of lime and brick to screen the eyes of the workmen from the fire; and sometimes on each side of the boccas is a boccarella, out of which coloured glass, or finer metal is taken from the piling-pot. To the furnace likewise occasionally belong ovens, or holes near the leer, for the calcining of tartar, iron, &c.

The leer, which serves to anneal and cool the vessel, and which Agricola makes a particular furnace, consists of a tower, besides the leer; the tower lies directly over the melting furnace, with a partition betwixt them about a foot thick, having an aperture called *oculus*, or *lumella*, through which the flame or heat ascends out of the furnace into the tower: on the floor or bottom of this tower, the vessels, fashioned by the artist, are set to be annealed; and as the flame has here a less degree of intensity than that which is sustained by the pots, the vessels, after they have been formed, cool slowly and gradually. This has usually two boccas, or mouths, by which the glasses are put in with a fork, and placed on the floor. The *leer* is an arched furnace five or six yards long, continued to the tower; through this the glasses, when annealed, are drawn in iron pans, called *jaculis*, by which they come to cool by degree, being quite cold by the time they reach the mouth of the leer, which enters the "farofel," or room where the glasses are to be set.

The *third* is the "green-glass furnace," which is a kind of compound of all the former. It is made square, (the two former being circular,) having an arch at each angle for annealing and cooling the glasses. The metal is wrought on two opposite sides, and on the other two they have their calcars, into which are made linen-holes for the fire to come from the furnace, to bake the frit, and also to discharge the smoke. Fires are made in the arches to anneal the vessels, so that the whole process is done in one furnace. The materials with which the sides of these furnaces are constructed are not ordinary brick (which would soon melt down into glass, as would also all the softer stones,) but hard and sandy kinds, called by Imperatorius "pyramachia." But when bricks are used, they should be formed of an earth which possesses in the highest degree the qualities of density and infusibility, for resisting the fire, which continues to act upon them, without cessation for a long time; as the fires in a glass-house are seldom suffered to go out, from the time when the furnace is first employed till it needs repair, and the interval may be two or three years; the walls of the furnace, for this reason, as well as the pots, are constructed chiefly of clay, mixed with sand, and other materials of a refractory kind, in due proportion. See **GLASS-pots.**

**GLASS of lead,** a glass made with the addition of a large quantity of lead, of great use in the art of making counter-fort glass. The method of making it is this: put a large quantity of lead into a potter's kiln, and keep it in a state of fusion with a moderate fire, till it is calcined to a grey loose powder: then spread it in the kiln, and give it a greater heat, continually stirring it to keep it from running into lumps; continue this several hours, till the powder becomes of a fair yellow; then take it out and sift it fine: this is called calcined lead.

Take of this calcined lead fifteen pounds, and crystalline, or other frit, twelve pounds; mix them as well as possible together; put them into a pot, and set them in the furnace for ten hours; then cast the whole, which will be now perfectly melted, into water; separate the loose lead from it, and return the metal into the pot; and after standing in

fusion twelve hours more, it will be fit to work. It is very tender and brittle, and must be worked with great care, taking it slowly out of the pot, and continually wetting the marble it is wrought upon. Neri.

It is well known, that cerufs, or white lead, minium, litharge, and all the other preparations and calces of lead, are easily fused by a moderate fire, and formed into a transparent glass of a deep yellow colour. But this glass is so penetrating and powerful a flux, that it is necessary to give it a greater consistence, in order to render it fit for use. With this view, two parts of calx of lead, e.g. minium, and other parts of sand, or powdered flints, may be put into a crucible of refractory clay, and baked into a compact body. Let this crucible, well closed with a luted lid, be placed in a melting furnace, and gradually heated, for an hour, or an hour and a half; and afterwards let the heat be increased, so as to obtain a complete fusion, and continued in that state for the same time: let this crucible remain to cool in the furnace, and when it is broken, a very transparent yellow-coloured glass will be found in it. Some add nitre and common salt to the above mixture, because these salts promote the fusion and the more equal distribution of the sand. This glass of lead has a considerable specific gravity, and its lowest part is always the heaviest. It is an important flux in the assays of ores to facilitate their scorifications.

Glass of lead is capable of all the colours of the gems in very great perfection. The methods of giving them are these: for green, take pulverine frit twenty pounds, lead calcined sixteen pounds; sift both the powders very fine; then melt them into a glass, separating the unmixed lead, by plunging the mass in water; after this return it into the pot, and add brass thrice calcined six ounces, and one pennyweight of crocus martis made with vinegar; put this in at six different times, always carefully mixing it together; let it finally settle an hour, then mix it together, and take a proof of it; when the colour is right, let it stand eight hours, and then work it. If instead of the calcined brass the same quantity of the caput mortuum of the vitriolum veneris be used, the green is yet much finer.

For topaze-colour take crystal frit fifteen pounds, calcined lead twelve pounds; mix them well together, by sifting the powders through a fine sieve; then set them in a furnace not too hot, and separate the superfluous unmixed lead, by casting the whole into water: repeat this twice; then add half gold yellow glass, and let them incorporate and purify, and they will be of the true and exact colour of the original topazes.

For sea-green, take crystal frit sixteen pounds, calcined lead ten pounds; mix and sift them together, and set them in a pot in a furnace: in twelve hours the whole will be melted; then cast it into water and separate it from the loose lead; put them into the furnace again for eight hours; then separate the loose lead by washing a second time, and return it to the pot for eight hours more. Neri. See GEMS.

GLASS, *Painting in.* The primitive manner of painting in glass was very simple, and of consequence very easy: it consisted in the mere arrangement of pieces of glass of different colours, in some sort of symmetry; and constituted a kind of what we call *Mosaic work*.

Afterwards, when they came to attempt more regular designs, and even to represent figures raised with all their shades, their whole address went no farther than to the drawing the contours of the figures in black, with water colours, and hatching the draperies, after the same manner, on glasses of the colour of the object intended to be painted. For the carnations, they chose glass of a bright red; upon which

they designed the principal lineaments of the face, &c. with black.

At last the taste for this sort of painting being considerably improved, and the art being found applicable to the adorning of churches, basilicas, &c. they found means of incorporating the colours with the glass itself, by exposing them to a proper degree of fire, after the colours had been laid on.

A French painter at Marfeilles is said to have given the first notion hereof, upon going to Rome, under the pontificate of Julius II. But Albert Durer, and Lucas of Leyden, were the first that carried it to any height.

The colours used in painting on glass are very different from those used either in painting in oil, or water.

The *black* is made of two-thirds of flakes, or scales of iron, beaten up, and mixed with another third of roccaille, or little glass beads. *White*, with sand, or little white pebbles, calcined, pounded in a mortar, and afterwards ground on marble; with one fourth-part of salt-petre, added thereto, and the mixture calcined and pulverized over again: to which, when they are ready to use it, is added a little gypsum, or plaster of Paris well ground, &c. For *yellow*, they use leaf-silver ground, mixed up in a crucible, with sulphur or salt-petre; then well beaten and ground on a porphyry stone; and, at length, ground over again with nine times as much red ochre. *Red* is made of litharge of silver, and scales of iron, gum Arabic, ferretta, glass-beads, and blood-stone, nearly in equal quantities. This is one of the most difficult colours, and the preparation only to be learned by experience. *Green* is made of *æs ultum*, one ounce; as much black lead, and four ounces of white sand, incorporated by the fire. After calcination, they add a fourth part of salt-petre: after a second calcination, a sixth part more: after which they make a third coction before it is used. *Azure*, *purple*, and *violets*, are prepared like green, only leaving out the *æs ultum*, and in the lieu thereof using sulphur for azure; perigneux for purple; and both these drugs for violet. *Carnations* are made of ferretta and roccaille. And lastly, colours for the hair, trunks of trees, &c. are made of ferretta, roccaille, &c.

This account of colours we have from M. Felibien's excellent work *Des Principes d'Architecture*, &c. though it must be owned, that all the painters on glass do not use them; there being few artists of that kind but have invented their own particular ones, whereof they usually make great secrets. But this is certain, that these above described are sufficient for the best paintings of all sorts; provided the person has but the skill to manage them.

In the windows of divers ancient churches, chapels, colleges, &c. we meet with the most beautiful and lively colours imaginable; such as far exceed any used among us: but it is not that the secret of making those colours is lost; but that the moderns would not go to the expence of them; nor take all the necessary pains; because this sort of painting is not now so much esteemed as formerly.

Mr. Walpole, in his *Anecdotes of painting in England*, has traced the history of this art from the reformation, when misguided zeal destroyed most of the monuments of it in our churches, through a series of professors to the present time. Among the later proficient in this art were Isaac Oliver, who painted the windows at Christ-church, Oxford, in 1700; William Price, who in the same year painted the windows in Merton chapel; William Price, the son, to whose art we owe the windows at Queen's, New-college, and Maudlin, of whom Mr. Walpole says, that his colours are fine, his drawing



good, and his taste in ornaments and Mosaic far superior to any of his predecessors, and equal to the antique. In 1761, Mr. Paterfon, an auctioneer late of Essex-house in London, exhibited the two first auctions of painted glass imported from Flanders; and undertook also to establish a manufacture of painted glass: several of the pieces of this ingenious artist exhibited colours vying in perfection with the old paintings.

Those beautiful works, among the painters in glass, which were made in the glass-house, were of two kinds: in some, the colour was diffused through the whole body of glass; in others, which were the more common, the colour was only on one side, scarce penetrating within the substance above one-third of a line; though this was, more or less, according to the nature of the colour; the yellow being always found to enter the deepest.

These last, though not so strong and beautiful as the former, were of more advantage to the workmen; because, on the same glass, though already coloured, they could shew other kinds of colours, where there was occasion to embroider draperies, enrich them with foliage, or represent other ornaments of gold, silver, &c.

In order to this, they made use of emery; grinding, or wearing down the surface of the glass, till such time as they were got through the colour, to the clear glass: this done, they applied the proper colours on the other side of the glass. By this means the new colours were prevented from running and mixing among the former, when the glasses came to be exposed to the fire, as will hereafter be shewn.

When the intended ornaments were to appear white, or silvered, they contented themselves to bare the glass of its colour with emery, without applying any new colour at all; and it was in this manner that they wrought the lights and heightenings on all kinds of colours.

The painting with vitreous colours on glass depends entirely on the same principles as painting in enamel; and the manner of executing it is likewise the same; except that in this the transparency of the colours being indispensibly requisite, no substances can be used to form them but such as vitrify perfectly: and, therefore, the great object is to find a set of colours, which are composed of such substances, as, by the admixture of other bodies, may promote their vitrification and fusion; are capable of being converted into glass; and melting, in that state, with less heat than is sufficient to melt such other kinds of glass as may be chosen for the ground or body to be painted; to temper these colours, so as to make them proper to be worked with a pencil; and to burn or reduce them by heat, to a due state of fusion, without injuring or melting the glass which constitutes the body painted. The first thing to be done, in order to paint on glass, in the modern way, is to design, and even colour, the whole subject on paper. Then they make choice of pieces of glass proper to receive the several parts, and proceed to divide or distribute the design itself, or the paper it is drawn on, into pieces suitable to those of glass; having always a view that the glasses may join in the contours of the figures, and the folds of the draperies; that the carnations and other finer parts may not be damaged by the lead wherewith the pieces are to be joined together.

The distribution being made, they mark all the glasses, as well as papers, with letters, or numbers, that they may be known again; which done, applying each part of the design on the glass intended for it, they copy or transfer the design upon this glass, with the black colour,

diluted in gum-water; by tracing and following all the lines and strokes, as they appear through the glass, with the point of a pencil.

When these first strokes are well dried, which happens in about two days, the work being only in black and white, they give it a slight wash over, with urine, gum Arabic, and a little black; and this several times repeated, according as the shades are desired to be heightened; with this precaution, never to apply a new wash, till the former is sufficiently dried. This done, the lights and risings are given, by rubbing off the colour in the respective places, with a wooden point or the handle of the pencil.

As to the other colours above-mentioned, they are used with gum-water, much as in painting in miniature; taking care to apply them lightly, for fear of effacing the outlines of the design; or even, for the greater security, to apply them on the other side, especially yellow, which is very pernicious to other colours, by blending therewith.

And here too, as in pieces of black and white, particular regard must be always had, not to lay colour on colour, or lay on a new lay, till such time as the former are well dried. It may be added, that the yellow is the only colour that penetrates through the glass, and incorporates therewith by the fire; the rest, and particularly the blue, which is very difficult to use, remaining on the surface, or at least entering very little. When the painting of all the pieces is finished, they are carried to the furnace or oven, to anneal or bake the colours. The furnace here used is small, built of brick, from eighteen to thirty inches square: at six inches from the bottom is an aperture, to put in the fuel, and maintain the fire. Over this aperture is a grate, made of three square bars of iron, which traverse the furnace, and divide it into two parts. Two inches above this partition is another little aperture, through which they take out pieces, to examine how the coction goes forward.

On the grate is placed a square earthen pan, six or seven inches deep; and five or six inches less, every way, than the perimeter of the furnace. On one side hereof is a little aperture, through which to make the trials, placed directly opposite to that of the furnaces destined for the same end.

In this pan are the pieces of glass to be placed in the following manner: first, the bottom of the pan is covered with three strata, or layers of quicklime, pulverized; those strata being separated by two others, of old broken glass: the design whereof is to secure the painted glass from the too intense heat of the fire. This done, the glasses are laid horizontally on the last, or uppermost, layer of lime.

The first row of glass, they cover over with a layer of the same powder an inch deep; and over this they lay another range of glasses: and thus alternately, till the pan is quite full; taking care that the whole heap always ends with a layer of the lime-powder.

The pan thus prepared, they cover up the furnace with tiles, on a square table of earthen-ware, closely luted all round; only having five little apertures, one at each corner, and another in the middle, to serve as chimnies.

Things thus disposed, there remains nothing but to give the fire to the work. The fire for the two first hours must be very moderate; and must be increased in proportion as the coction advances, for the space of ten or twelve hours; in which time it is usually completed. At last,

the fire, which at first was only of charcoal, is to be of dry wood: so that the flame covers the whole pan, and even issues out at the chimnies.

During the last hours, they make assays from time to time, by taking out pieces laid for that purpose, through the little aperture of the furnace, and pan, to see whether the yellow be perfect, and the other colours in good order. When the annealing is thought sufficient, they proceed with great haste to extinguish the fire, which otherwise would soon burn the colours, and break the glasses. See PAINTING.

*GLASS, painting on, by means of prints.* See BACK-printing.

*GLASS, polishing of.* See POLISHING and GRINDING.

*GLASS-porcelain*, the name given by many to a modern invention of imitating the china-ware with glass. The method given by M. Reaumur, who was the first that carried the attempt to any degree of perfection, is delivered by that gentleman in the Memoirs of the Academy of Sciences of Paris, to this effect. This change of glass was first taken notice of by Neumann, who, in distilling milk in a glass retort, observed, that the bottom of the vessel acquired the appearance of porcelain, which he attributes to the fine white earthy matter of the milk forced into the glass by heat. Neum. Chem. Works by Dr. Lewis, p. 571.

The mixing of glass reduced to powder, with other less easily vitrifiable substances for forming a paste, to be afterwards made into a sort of a porcelain, has been a contrivance long practised, but it is very troublesome, and the result subject to many faults; but this new ware is made of glass alone, and that with much less trouble, and without the reducing it to powder. By this art, vessels of glass are changed into vessels of a sort of porcelain, without altering their form, and the meanest glass made only of sand, lime, and saline ashes, serves as well as the best for that purpose: our common coarse green quart-bottles, or the great bell glasses with which gardeners cover their melons, &c. being by this means changeable into a beautiful white sort of porcelain ware; and this is to be done in so easy a manner, and with so small expence, that it requires no more trouble or charge, than that of baking a common vessel of our coarse earthen-ware; and for this reason the vessels of this sort of ware may be afforded extremely cheap.

It is very certain, that all porcelain ware is a substance in the state of semi-vitrification: and in order to bring glass, which is a wholly vitrified substance, into the condition of porcelain, there requires no more than to reduce it to a less perfectly vitrified state.

The question which would naturally be started on this occasion, is, whether it be possible to reduce glass to a less vitrified state, it having already undergone what is esteemed the last change by fire. But when we consider, that the mass of antimony, the vitrifications of many of the metals, as the glass of lead, and the counterfeit gems coloured by the metals, are more or less easily reduced again by chemistry to metals, &c. the reducing of sand, flints, &c. after they are vitrified, at least a little way back toward their native or pristine state, may appear not wholly impracticable, and the attempts which M. Reaumur made on this occasion, were what gave him the first hints of the glass-porcelain; called from his name "Reaumur's porcelain."

The method of making it is this. The glass vessels to be converted into porcelain are to be put into a large earthen vessel, such as the common fine earthen dishes are baked in, or into sufficiently large crucibles; the vessels are to be filled with a mixture of fine white sand, and of fine gypsum or plaster-stone burnt into what is called plaster of Paris, and

all the interstices are to be filled up with the same powder; so that the glass vessels may no where touch either one another, or the sides of the vessel they are baked in. The vessel is to be then covered down and luted, and the fire does the rest of the work; for this is only to be put into a common potter's furnace, and when it has stood there the usual time for the baking of the other vessels, it is to be taken out, and the whole contents will be found no longer glass, but converted into a white opaque substance, which is a very elegant porcelain, and has almost the properties of that of China. Memoirs Acad. Sciences Par. 1739.

The powder which has served once, will do again as well as fresh, and that for a great many times; nay, it seems, ever so often. The cause of this transformation, says Macquer, is probably that the vitriolic acid of the gypsum quits its basis of calcareous earth, and unites with the alkaline salt and saline earth of the glass, with which it forms a kind of salt or selenites, differing from the calcareous selenites, by the interposition of which matter the glass acquires the qualities of porcelain. Dr. Lewis, from a variety of experiments on the nature and qualities, and method of producing this porcelain, has deduced the following conclusions: 1. Green glass cemented with white sand received no change in a heat below ignition: in a low red-heat, the change proceeded very slowly; but in a strong red-heat, approaching to whiteness, the thickest pieces of glass bottles were thoroughly changed in three hours. 2. The glass sustained the following progression of changes. Its surface first became blue; its transparency was diminished, and when held between the light and the eye, it appeared of a yellowish hue: afterwards it was changed a little way on both sides into a white substance, externally still blueish: and as this change advanced still farther and farther within the glass, the colour of the vitreous part in the middle approached nearer to yellow: the white coat was of a fine fibrous texture, and the fibres were disposed nearly parallel to one another, and transverse to the thickness of the piece: by degrees the glass became throughout white and fibrous, the external blueness at the same time going off, and being succeeded by a dull whitish or dun colour: by a still longer continuance in the fire, the fibres were changed gradually from the external to the internal part, and converted into grains; and the texture then was not unlike that of common porcelain. The grains, at first fine and somewhat glossy, appeared afterwards larger and duller, and at length the substance of the glass became porous and friable, like a mass of white sand slightly cohering. 3. Concerning the qualities of the converted glass Dr. Lewis observes, that the whiteness of the internal part was not inferior to that of porcelain, but that its surface was the least beautiful; that the thick pieces were quite opaque, and that several thin pieces were semi-transparent: that while it remained in a fibrous state, its hardness became greater than that of glass, or of the common kinds of porcelain; it was capable of sustaining sudden changes of heat and cold better than any porcelain; and in a moderate white heat, it was subtle into a substance not fibrous, but vitreous and smooth, like white enamel: that when its texture had been coarsely granulated, it was now much softer and unshiftable; and, lastly, that when some coarsely granulated unshiftable pieces which, with the continuance of a moderate heat, would have become porous and friable, were suddenly exposed to an intense fire, they were rendered remarkably more compact than before; the solidity of some of them being superior to that of any other ware. 4. No differences appeared in the internal colour, hardness, texture, or the regular succession of changes, from the use of different cementing substances; though

though in external appearance the differences were considerable. All the pieces which had been surrounded with charcoal or with soot were externally of a deep black colour, which did not disappear by exposure to a strong fire during an hour, with free access of air. Coloured clays and sands communicated different shades of a brown colour; and white earths gave whitish, greyish, or brownish tinge. White sand, calcined flints, and gypsum, gave in general the greatest whiteness, and tobacco-pipe clay the greatest glossiness and brightness. Glasses composed of earths without alkaline salt, glass of lead, flint-glass, crown-glass, looking-glass plates, a glass prepared with calcined flints and a fixed alkaline salt, and even green glass which had been fused together with a ninth part of alkaline salt, suffered none of the above alterations by cementation. Green bottle-glass and common window-glass were most susceptible of these alterations. 6. The changes produced by cementation could not proceed from any absorption of matter from the cementing substance; because no increase of weight was given, and because the same changes were produced upon a piece of glass merely by heat, without any cementing substance. See Com Phil. Techn. p. 235—255.

Mr. Gregory Watt, in his valuable paper on basalt (Phil. Trans. for 1803, cited by Aikin,) alleges this porcellaneous change of glass as an illustration of his important principle, *viz.* "that bodies whose fibres have a natural tendency to a crystalline arrangement, or a polarity, when vitrified by a sufficient heat and cooled hastily in the vitreous state, are able subsequently to return to their natural crystalline arrangement of fibre, when exposed to a heat merely sufficient to soften the texture, though not enough for fusion. This, in the instance of basalt, he shews by the singular crystallizations formed in the cells of fused basalt, long after it had lost the liquidity of fusion. The circumstance of no material change occurring in the weight of glass by this conversion into the fibrous state, shews incontestably that it cannot be owing either to any thing gained during the process, nor to any material loss of the alkali; and this is also rendered manifest by its return to the vitreous state and vitreous qualities when again melted. This too may again be porcellanized in the same way, and again be melted into glass, and so on alternately." See PORCELAIN.

**GLASS-pots**, the vessels in the glass manufacture used for melting the glass. Those for the white glass works are made of a tobacco-pipe clay, brought from the Isle of Wight, which is first well washed, then calcined, and afterwards ground to a fine powder in a mill; which being mixt with water, is then trod with the bare feet till it is of a proper consistence, to mould with the hands into the proper shape of the vessels. When these are thus made, they are afterwards annealed over the furnace. Those for the green-glass work are made of the nonfuch, and another sort of clay from Staffordshire; they make these so large as to hold three or four hundred weight of metal. And besides these, they have a small sort called piling pots, which they set upon the larger, and which contain a finer and more nice metal fit for the nicest works. Neri.

The clay that is used for this purpose should be of the purest and most refractory kind, and well cleansed from all sandy, ferruginous, and pyritous matters; and to this it will be proper to add ground crucibles, white sand, calcined flints duly levigated, or a certain proportion of the same clay baked, and pounded not very finely. The quantity of baked clay that ought to be mixed with the crude clay, to prevent the pots from cracking when dried, or exposed to a great heat, is not absolutely determined, but depends on

the quality of the crude clay, which is more or less set. M. D'Antic, in a memoir on this subject, proposes the following method of ascertaining it: the burnt and crude clay, being mixed in different proportions, should be formed into cakes, one inch thick, and four inches long and wide. Let these cakes be slowly dried, and exposed to a violent heat, till they become as hard and as much contracted as possible, and in this state be examined; and the cake, he says, which has suffered a diminution of its bulk equal only to an eighteenth part, is made of the best proportions. He observes, in general, that most clays require that the proportion of the burnt should be to the fresh as four to five.

It is of great importance that the material of which pots are made should be carefully selected, as they are exposed to the action of a very fierce fire, and also to the solvent activity of the glass with its powerful fluxes. They should also be made very thick and strong, as they are intended to last for many months. When finished, they are placed in a warm room in order to discharge their moisture, and any small fissures arising from the unequal shrinking of the clay are closed by gently heating with a mallet. They are afterwards gradually heated in a small oven, constructed for this purpose, and slowly brought to a red heat; and after remaining for some time in this state, they are removed to the furnace, and fixed down in their places by fire-clay. Here, on account of a further shrinking, they remain for a day or two before they are fit for receiving the glass materials. Pots of this kind are said to last, at an average, about a year.

**GLASS Tubes** are of various lengths, diameters, and forms, according to the purposes to which they are applied. These are often formed with the lamp and blow-pipe, in the manner described under the article **LAMP-blowers**. In this way tubes are sealed hermetically (see **HERMETIC Seal**), tubes are bent, others are joined, bulbs are annexed to tubes for thermometers, &c. and glass is drawn out into threads.

It has been observed, that glass tubes laid before the fire in an horizontal position, and with their extremities supported, have had a rotatory motion about their axes; and also a progressive motion towards the fire, even when their supports are inclined from the fire, so that the tubes will move a little upwards. See Phil. Trans. N<sup>o</sup> 476. § 1.

When the progressive motion of the tube is stopped by any obstacle, its motion about its axis will still continue. When the tubes are placed in a nearly upright posture leaning to the right hand, the motion will be from east to west; but if they lean to the left, the motion will be from west to east; when the nearer they are placed to the perfectly upright posture, the less the motion will be either way.

If the tube be placed horizontally on a glass plane, the fragment, for instance, of coach window-glass, instead of moving towards the fire, will move from it, and about its axis, in a contrary direction to what it had done before. Nay, it will recede from the fire and move a little upwards, when the plane inclines towards the fire.

Neither the draught of air up the chimney, nor attraction or repulsion, are the cause of these phenomena. It seems rather owing to the swelling of the tube towards the fire; for allowing such swelling, gravity must pull the tube down, when supported near its extremities horizontally; and a fresh part being exposed to the fire and swelling out again, must fall down again, and so on successively; which will produce a rotatory motion towards the fire.

If the tube be supported by two other tubes, and these be brought near to each other, and to the centre of the supported tube, then its parts hanging over on each side, being larger than the part which lies between the supporters, will

by their weight, pull downwards, and consequently force the middle part, resting upon its two props, upwards: and being less advanced towards the fire, as being less heated, will, by their oblique situation, pull the middle part backwards also from the fire, which will cause a rotatory regressive motion, quite contrary to what the tube had when supported near its extremities. And when a single tube lies inclining opposite to the fire, either to the right hand or to the left, out of a plane perpendicular to the surface of the fire, gravity will not permit the curved part to rest, but pull it down till it coincides with a plane perpendicular to the horizon; and consequently, as new curves are generated, new motions will be so too; that is, the tube will be made to move about its axis, with this difference, when the tube inclines to the right hand, the motion will be from east to west; when to the left hand, from west to east. The justness of this reasoning is made manifest, by bending a wire, and supporting it first near its extremities, then near its centre on each side, afterwards inclining it to the right and to the left; the bending in every case representing the curved part of the tube next the fire. This solution of the phenomena is rendered the more probable from hence, that when four supporters were made use of, one at each extremity, and two near the middle, there was no motion at all, either backward or forward. Nor does the increase of contact hinder the motion, because the plate of glass was so broad as to have a much greater contact with the tube, and yet both the rotatory and regressive motions were manifest.

These experiments succeeded best with tubes about twenty or twenty-two inches long; the diameter about one-tenth of an inch: and they had in each a pretty strong pin fixed in cork, for an axis to roll with on the supporting tubes. Phil. Trans. N. 476.

GLASS receivers, how to cement the cracks of. See CEMENT and RECEIVER.

GLASS, how to take the impression of antique gems in. See GEM.

The property which glass possesses in common with other substances of being expanded by heat, and contracted by cold, was long ago observed and evinced by Mr. Hook. See Birch's Hist of the Royal Society, vol. i. p. 411. See THERMOMETER.

GLASS, *Laws relating to.* No glass shall be imported into Ireland, other than the manufacture of Great Britain, on pain of forfeiting the same, and ship, and 10s. a pound. 19 G. II. c. 12. If any foreign glass shall be landed or unshipped before entry and payment of the duties, or without warrant from the proper officer, the same shall be forfeited, or its value; and the master or other person having command of the vessel, and every other person concerned in such landing or unshipping, shall forfeit 100l. 17 G. III. c. 39. And by 38 G. III. c. 33. for preventing the fraudulent importation of glass, every package containing any plate or plates of glass unframed, being *plate, crown, or sheet* glass, which shall be imported, or brought into this kingdom for exportation, shall be marked on the outside in Roman letters four inches long at least, with the word GLASS, on pain of forfeiture, together with the package, and all goods contained in it. The master of the vessel importing such package, shall, in reporting his cargo, express every such package of glass, on pain of forfeiting the same, and also 100l. Nor shall any such package be imported, which shall not contain 500 weight, on pain of forfeiture; but not extending to any piece of glass 60 inches in length or upwards, on account of the package not being marked. By 43 G. III. c. 69. For every 100 weight of materials, &c. that shall be made use of in Great Britain for the making of *plate or flint glass,*

or *enamel, stained, or paste glass, or phial glass,* shall be paid by the maker thereof 1l. 12s. 8d.; for every hundred weight of materials used in making *spread window glass,* commonly called *broad glass,* 8s. 2d.; for every hundred weight of materials used for making all other *window glass* (not being spread glass), whether flashed, or otherwise manufactured, commonly called *crown glass,* or *German sheet glass,* 1l. 4s. 6d.; for every hundred weight of materials used in making *common bottles* (not being phials), and of vessels used in *chemical laboratories,* and of *garden glasses,* and of all other vessels or utensils made of common bottle metal, 4s. 1d.; and for every hundred weight of plate glass, and of all other glass manufactures, which shall be imported into Great Britain, the same not being flasks, in which wine or oil is imported, nor foreign green glass bottles, nor Irish glass, or glass manufactures imported directly from Ireland, to be paid by the importer before the landing thereof, 2l. 2s. And any glass-maker shall take out a licence, for which he shall pay 10l., to be renewed annually ten days at least before the end of the year, on the penalty of 50l. 24 G. III. c. 41. 43 G. III. c. 69. The place of making glass shall be entered, before the commencement of manufacture, and all work-houses, furnaces, pots, annealing arches, &c. &c. on pain of forfeiting 200l. 19 G. II. c. 12. 17 G. III. c. 39. 35 G. III. c. 114. Officers may enter and survey, and mark pots; and any person counterfeiting or altering such mark, or conniving at its being done, shall forfeit 500l.; or defacing, or causing to be defaced or obliterated such mark, incurs a forfeiture of 200l. 35 G. III. c. 114. Notice of beginning to work shall be given in writing, on pain of forfeiting 20l. 19 G. II. c. 12. And notice of filling every pot shall be given twelve hours before the operation is begun, on pain of 50l. 19 G. II. c. 12. 17 G. III. c. 39. Annealing arches are to be made of a certain form, and numbered, on pain of forfeiting 100l. Annealing arches are to be locked, except at certain times; and breaking such lock, &c. incurs a forfeiture of 200l. 35 G. III. c. 114. The same act comprehends several other provisions, enforced by certain penalties. Bottles are not to be removed till they are weighed, (penalty 100l.) which are to be kept separate from those that are unweighed, on pain of forfeiting 50l. No phials, &c. are to be made in places entered for making common glass bottles, on pain of forfeiting 200l. Entry shall be made of the glass manufactured every month within the bills, and elsewhere every six weeks, on pain of 20l. The maker, within the bills, shall, in four weeks, and elsewhere in six weeks after entry, pay off the duties, on pain of double duty. If glass, shipped for exportation, shall be re-landed, it shall be forfeited, and every person concerned therein shall forfeit 100l. 17 G. III. c. 39. For the drawbacks on exportation of glass, see 43 G. III. c. 69. Obstructing officers in securing the duties incurs a forfeiture of 50l. 19 G. II. c. 12. 17 G. III. c. 39. Penalties are appropriated, half to the use of the king, and half to him that shall sue.

GLASS-Carrick Point, in *Geography,* a cape of Ireland, on the eastern coast of the county of Wexford. N. lat. 52° 35'. W. long. 6 12'.

GLASS-Case, in *Gardening,* a light sort of erection formed with glass sashes in proper frame-work, mostly upright in the front part and ends, but sloping at top from a back wall, or other convenient building, to the fore-part; the front, top, and both ends being of glass-work. The situation for this purpose should face the south, in order to have the full influence of the sun. Constructions of this nature are useful for protecting many sorts of curious tender plants in winter which want it only occasionally from severe frost, and other similar causes.

Buildings of this kind may be constructed, occasionally, either against some ready-built south wall, which serves for the back, all the other parts forward being wood-work and glass; or detached in a similar situation, so as that the whole front may stand to the south; the back being framed of brick-work, &c. or of wood double planked; but the former is preferable; the whole being generally ranged lengthways, nearly in an east and west direction.

The dimensions may be from five or six, to eight or ten feet in width, by ten, fifteen, or twenty feet in length or more, as may be required; and from six or eight, to ten feet high behind, by five or six to seven or eight in the front, both ends in proportion with the top, sloping gradually, as just noticed, from the back, having an entrance, or door, in front, or at one end. The glass-work should be made to slide readily backwards and forwards.

Sometimes fire-flues are carried along the back and front internally, proceeding from an external furnace, for occasional fire-heat in winter, which render them more convenient and useful for different purposes.

These cases, as mentioned above, are used as preservative departments, in which to winter many sorts of curious exotics of the harder green-house kind, which only want protection from severe cold, as well as many choice kinds of the open ground, which are rather tenderish in their minor growth, or any other particular or curious hardy plants, whether flowers, shrubs, or young trees, especially the choice evergreen kinds, which require effectual protection from the ravages of rigorous frosts or cutting winds, in winter or early spring; and, at the same time, in mild open weather, to enjoy the full air by opening the glasses; all which, being in pots, can be readily placed in this preservative at the approach of severe weather, and be thus kept in good condition till settled weather in spring, &c.; then removed into the full air. In summer and autumn, when unoccupied in this way, these cases may be of some utility to place some curious kinds of tender plants in, when in flower for seeding, to guard them from heavy or incessant rain, or cold night dews in autumn, which, in many sorts retard, or sometimes wholly frustrate their production of good seed, as in many sorts of curious tender annuals; particularly the fine double balsams, cock's-combs, tricolors, double stramoniums, diamond ficoides, and various others.

They are also capable of being used in spring and the early part of summer, as in April, May, and June, as a kind of drawing-frames, for some particular sorts of curious annuals to bring them to a tall growth, such as the large or giant cock's-combs, tricolors, double stramoniums, double-striped balsams, egg-plants, &c. the plants being first raised in hot-beds, under garden-frames, till of twelve or fifteen inches growth, then a hot-bed made in the glass-case, earthed at top, and the plants in pots, singly plunged into the earth of it; the glasses, in these cases, should be shut close, only a necessary admission of fresh air being given every day, by which they run up to a tall stature in the best perfection of strength for flowering. See *Annual PLANTS*.

These sorts of glass-cases are also sometimes made use of as a kind of appurtenances to hot-houses, or stoves, detached from them, having, as observed above, internal flues for fire-heat, when necessary, serving as preservatives for many sorts of exotics, which are tenderer than common green-house plants, but do not require the constant full heat of the more tender hot-house kinds, but only the assistance of moderate fire-heat in winter, in cold nights, or when very damp, cloudy, foggy-weather and severe frosts prevail. They are sometimes used in the business of forcing different kinds

of flowering plants and esculents, either by means of an internal bark-bed, or flues for fire-heat.

When intended for this purpose, it is convenient to have both an internal pit for a bark-bed, and flue for fire-heat, in order to use either separately, or sometimes both, as may be found necessary. See *HOT-HOUSE*.

*GLASS-FACES*, in *Mining*, is a term for the polished surfaces, or slickensides, which are found in some of the mineral veins in Derbyshire, something like the polishing which is seen often on the sides of faults. See *SLICKEN-SIDE*.

*GLASS ISLE*, called also *Sealsey*, in *Geography*, one of the Hebrides, near the N.E. extremity of Harris. It is a small, low, round island, covered with heath, and indented by the sea. Near its western extremity are two good natural harbours, and on its east point a light-house was erected A. D. 1788. It lies at the entrance of Eil Loch Tarbot. N. lat. 57 50'. W. long. 6 40'.

*GLASS-LEAD*, in *Mining*, according to Mr. Mawe, "Mineralogy of Derbyshire," p. 105, is an opaque waxy lead-ore found in that county; sometimes also it is transparent and crystallized, appearing as though it had undergone the action of fire.

*GLASS-LOUGH*, in *Geography*, a lake of Ireland, in the county of Monaghan, near which is a village of the same name, about five miles from the town of Monaghan. The lake contains 120 acres; and a wood, spreading over a fine bold hill, hangs down to the water in one deep shade, the effect of which is remarkably beautiful. The county around is very fine. Young.

GLASSES are distinguished, with regard to their form, use, &c. into various kinds, as drinking-glasses, optic-glasses, looking-glasses, burning-glasses, &c.

GLASSES, *Drinking*, are simple vessels of common glass or crystal, usually made in form of an inverted cone.

Each glass consists of three parts, *viz.* the calyx or bowl; the bottom, and the foot; which are all wrought or blown separately.

Nothing can be more dexterous and expeditious than the manner wherein these parts are all blown; two of them opened, and all three joined together. An idea is only to be had thereof, by seeing them actually at work.

The glasses chiefly used in England are made of the ashes of fern; crystal glasses being less frequent in use. The exceeding brittleness of this commodity, notwithstanding the easy rate of each glass, renders the consumption thereof very considerable. For the method of gilding the edges of drinking-glasses, see *GILDING on Enamel and Glass*.

GLASSES, *Metallic*, in *Chemistry*, are the oxyds, or sometimes the sulphuretted oxyds of the different metals, vitrified by heat.

GLASSES, *Optic*, are those made use of to strengthen, improve, or preserve the sight. See *OPTIC GLASSES*.

GLASSES, *Convex*. See *CONVEXITY*.

GLASSES, *Concave*. See *CONCAVE*.

GLASS, *Infernal*. See *INFERNAL*.

GLASSES, *Lenticular*. See *LENS*.

GLASSES, *Meniscus*. See *MENISCUS*, &c.

GLASSES, *Plain*. See *PLAIN GLASS*.

GLASSES, *Plano-Concave*. See *PLANO-CONCAVE*.

GLASSES, *Plano-Convex*. See *PLANO-CONVEX*.

GLASSES, *Telescope*. See *TELESCOPE*.

GLASS, *Object*. See *OBJECT-GLASS*.

GLASSES, *Eye*. See *EYE-GLASS*.

GLASS, *Magnifying*. See *MAGNIFYING*.

GLASS, *Multiplying*. See *MULTIPLYING*.

GLASSES, *Musical*. See *ARMONICA*.

GLASS, *Perspective*. See PERSPECTIVE.

GLASS, *Looking*. See LOOKING-Glass, MIRROR, and FOLIATING.

GLASS, *Burning*. See BURNING-Glass.

GLASS, *Weather*. See WEATHER-Glass.

GLASS, *Cupping*. See CUPPING-Glass.

GLASS, *Window*. See WINDOW and GLASS, *supra*.

GLASS, *Axis of a*. See AXIS.

GLASS, *Pole of a*. See POLE.

GLASS, *Hour*. See HOUR-Glass.

GLASS, *Tin*. See BISMUTH.

GLASS, *Watch*. See KALI.

GLASS-Wort. See KALI.

GLASS-Wort, *Berry-Bearing*, in *Botany*. See ANABASIS.

GLASS-Wort, *Jointed*. See SALICORNIA and KELP.

GLASSHATTEN, or GLASITTEN, in *Geography*, a town of Hungary, celebrated for its hot-baths, and having near it some rich gold mines; 7 miles from Schemnitz.

GLASS-HOUSE BAY, a bay on the E. coast of New Holland, between cape Moreton, and the Glass-houses, which are three hills, so called by captain Cook in 1770, situated in S. lat. 26° 28'.

GLASSHUTTEN, a town of Saxony, near which is a silver mine; 8 miles S. of Dresden.

GLASSIUS, SOLOMON, in *Biography*, was born in the year 1593, and it is supposed he was educated at Jena, where he was admitted to the degree of doctor of divinity, and for some time filled the theological chair with distinguished reputation. He was appointed superintendent of the churches and schools in the duchy of Saxe-Gotha, and exercised the duties of his function with prudence, equity, and impartiality. He died at Gotha in 1656, and left behind him, as a memorial of his fame and learning, a work published in quarto in 1623, entitled "Philologia Sacra," which is pronounced by Molheim an inestimable and immortal work, than which none can be more useful for the interpretation of Scripture, as it throws much light upon the language and phraseology of the inspired writers. He was author, likewise, of "Onomatologia Messicæ Prophetica;" "Chritologia Mosaica et Davidica;" "Esegefis Evangeliorum et Epistoliarum," and some other pieces. Moreri.

GLASSNEVIN, in *Geography*, a village near Dublin, in Ireland, remarkable for the very extensive and valuable botanical garden belonging to the Dublin society. See DUBLIN Society.

GLASSY HUMOUR. See EYE and VITREOUS.

GLASTONBURY, in *Geography*, a market town in the hundred of Glaston, and county of Somerset, England, is situated on the great road from Wells to Exeter. The site occupied by it was originally called Ynyfwytryn, or the Glass Island, and in Latin Avalonia.

A town is said to have been built here, and largely endowed by king Ina about the year 708: in the next century it was laid waste by the Danes, and rebuilt by king Edmund, who granted it many additional privileges. In 1184 it was destroyed by fire, and was again restored by the munificence of Henry II. The chief celebrity attached to the town was derived from its abbey; which, during six centuries, surpassed in authority and revenues every other in England, excepting that of Westminster. The abbots enjoyed a state of regal splendour, with an income of nearly 20,000*l*. per annum, had the title of lords, and sat with the barons in parliament. The abbey and its offices occupied an area of land of nearly sixty acres within the walls.

The last abbot, Richard Whiting, who was the sixtieth

in succession, refusing to surrender his abbey to king Henry VIII. was, with two of his monks, drawn on a hurdle to the Torr, near the town, and there hanged: the abbot's head was set on the gate of the abbey, and his quarters were sent to Bath, Wells, Bridgewater, and Ilchester.

It being traditionally recorded, that this was the burial place of king Arthur, Henry II. ordered a search to be made, when a leaden cross was discovered with a Latin inscription in rude characters, thus translated; "Here lies the famous king Arthur, buried in the isle of Avalon." Beneath was found a coffin hollowed out of the solid rock, wherein were the bones of a human body, supposed to be those of Arthur; which were then deposited in the church under a monument. Scarcely any vestige remains of these extensive buildings, except some ruins of the church, part of a chapel dedicated to Joseph of Arimathea, and the abbot's kitchen, which seems to be of a more recent structure than the other offices.

Among the religious relics with which the town and its environs abound, the most conspicuous is the Torr, or St. Michael's Tower (on which abbot Whiting was executed,) standing on an eminence east of the town, where was formerly a small oratory, dedicated to St. Michael the archangel.

The town of Glastonbury consists of two principal streets, and is divided into two parishes, St. John's and St. Benedict's. It was formerly a parliamentary borough, but was disfranchised on the confiscation of the abbey in 1539. A charter of incorporation was granted by queen Anne, by which the civil government was vested in a mayor, a justice, eight aldermen, and sixteen burgessees. The principal buildings are the two parish churches, two meeting-houses, two alms-houses, and a free school. The George, a respectable inn, was anciently an hospital for the accommodation of pilgrims resorting to the shrine of St. Joseph. In the centre of the town was formerly a large stone cross, originally appropriated to shelter persons who attended the market. It was taken down about five years ago: but a plate and description are preserved in the first volume of the Architectural Antiquities of Great Britain. Glastonbury is 130 miles distant from London; has a market on Tuesdays, and four annual fairs: the population return, in 1801, was 410 houses, and 2035 inhabitants, of whom only 104 were employed in trade, which is chiefly that of manufacturing worsted stockings.

South-west of the town is Wearyall hill, so called from a tradition that St. Joseph and his companions, weary with their journey, rested here; and that St. Joseph stuck his hawthorn staff in the earth; it took root, and constantly budded on Christmas day. This famous thorn had two trunks, of which one was destroyed in queen Elizabeth's reign, the other in the great rebellion: but there are trees, originally from the old stock, still growing in the gardens of Glastonbury, and in various other parts of the kingdom. Colliuon's Hist. Somersetshire, 3 vols. 4to. Maton's Western Counties, 2 vols. 8vo.

GLASTONBURY, a township of America, in the county of Bennington, and state of Vermont; having only 48 inhabitants.—Also, a handsome little town in Hartford county, Connecticut, situated on the E. side of Connecticut river, opposite to Weathersfield; containing 2718 inhabitants.

GLASTONBURY Thorn, in *Botany*. See MESPILUS.  
GLASTUM, from the German word *Glas*, an old name for Woad; (see ISATIS.) Hence several plants have the specific name of *glassifolia*, on account of the similitude of their leaves to that herb.

GLATT,



GLATT, in *Geography*, a river of Germany, which runs into the Neckar, 2 miles N. from Sultz in Württemberg.

GLATT, or *Glatt*, a town of Germany, in the county of Fugger; 4 miles E. of Dornstetten.

GLATT, a river of Switzerland, which runs into the Rhine; 2 miles below Eglisau.

GLATTEN, a mountain of Switzerland; 10 miles S. S. W. of Glaris.

GLATZ, a principality of Silesia, bordering on Bohemia, and surrounded by mountains. The internal territory is mountainous, intersected with vallies, meadows, corn-fields, woodlands and small rivers. It produces wheat, generally sufficient for its inhabitants, and has pasture for a great number of cattle. It contains quarries of mill-stones, free-stone, and marble; as well as a great variety of precious stones. It has also mines of coal, copper, and silver; with several mineral springs. From 1561 to 1742, Glatz was annexed to the crown of Bohemia; in 1742 it was ceded by the empress Maria Theresa to Frederick II. king of Prussia, and his heirs. It forms one circle, divided into six districts.

GLATZ, the capital of the principality above-mentioned, is situated on the Neisse, and built on the side of a mountain, having upon its summit a strong castle. The town contains about 400 houses within the walls, and as many in four faubourgs. It is a place of considerable trade. It has been frequently pillaged and burnt; 54 miles E. of Breslau. N. lat. 50° 16'. E. long. 16° 26'.

GLATZ *Kogel*, a mountain of Austria; 12 miles S. of Steyr.

GLAVACIA, a town of Walachia; 35 miles W. of Bucharest.

GLAUBER, JOHN RODOLPH, in *Biography*, a celebrated chemist of Amsterdam, who was esteemed the Paracelsus of his age, was born in Germany in the beginning of the sixteenth century. He travelled much in the pursuit of chemical knowledge, and collected many secret processes; and his experiments contributed to throw much light on the composition and analysis of the metals, inflammable substances, and salts. In fact he passed the greater part of his life in the laboratory. He did not always see the proper application of his own experiments, and vainly fancied that he had discovered the panacea, and the philosopher's stone, which were at that time objects of pursuit; and the disappointment of many persons, who had been seduced by his promises, contributed to bring the art of chemistry into contempt. His theory is full of obscurity; but his practice has perhaps been misrepresented by those who listened to his vain and pompous pretensions; and who accuse him of a dishonourable traffick, in first selling his secrets to chemists at an enormous price, of again disposing of them to other persons, and lastly, of making them public in order to extend his reputation. Glauber published about twenty treatises; in some of which he appears in the character of physician, in others in that of an adept or metallurgist; in the latter he most particularly excelled. However, it would be unjust not to give him the praise of acuteness of mind, of facility and address in the prosecution of his experiments, and of extensive chemical knowledge. He was the inventor of a salt, which to this day retains his name in the shops of our apothecaries. The works of Glauber have appeared in different languages; the majority of editions are in German, some in Latin, and others in French. A collection of the whole in Latin was published at Frankfort in 1658, in 8vo. and again 1659 in 4to. An English translation was published by Christopher Pack, London, 1689, in 6to. Ely. Dict. Hist.

GLAUBER *Salt*, native or natural, in *Mineralogy*, the sulphat of soda of chemists, was discovered by baron Born in the salt mines of Upper Austria; after which Momet, Volta, Suckow, Gmelin, Breislak, Pallas, and others have added to the list of the localities of this saline substance, which is more frequently found in a native state than has been supposed by some writers. It generally occurs a mealy efflorescence; sometimes massive, seldom stactitical or crystallized: in which latter case the crystals are described as acicular and six-sided prisms, more or less flatly acumined by three planes, set on the lateral edges, or sometimes on the lateral planes: they are shining; their internal lustre is vitreous. Fracture of the crystals small conchoidal. It varies from transparent to opaque according to its freshness. It is brittle. Its taste is a mixture of salt and bitter. Besides in the above forms, it occurs also, and most frequently, dissolved in certain mineral waters, in the neighbourhood of salt mines and salt lakes, where also the efflorescence is mostly found on moorish ground, sand stone, marble slate, and new walls. For the chemical character of this salt, see *SODA, Sulphat of*.

Brongniart has given the most complete list of the localities of Glauber salt. In solution it occurs in the waters of several lakes of Austria and Lower Hungary, especially in that of Neuhedel, between the counties of Oedenburg and Wieselburg. It is met with in Switzerland; in Spain, round a source in the neighbourhood of Aranjuez, and near Vacia-Madrid, as efflorescence, at the bottom of a ravine: the source which issues from the ravine contains a great proportion of this salt. Also the water of the Tagus is said to hold it in solution. In France it has been found near Grenoble. The steep sides of the Solfatara of Ponzzole yield this salt, in one place, on the north side. It is common in the lakes of Siberia; and it has been observed that the bottom of the lake Gunistkoi, between Toion and Hynskoy, is covered with a crust of Glauber salt as soon as the temperature is below the freezing point. Pallas tells us that the apothecaries of Orenburg annually collect a quantity of this salt, which is deposited in autumn at the bottom of a lake between the Tobol and Moos. It is also found in a lake near Gourief; in another between Utoiska and Minulkaia, in the neighbourhood of Eniffey; likewise at the foot and in the middle of the chains of the Ural mountains, near Tsheliabinsk: in the last of these places, the salt issues in the spring season out of the earth in the form of efflorescence or froth. The clayey soil of that neighbourhood does not contain any Glauber salt; whence this is supposed to be formed, in the same manner as salt-petre is, at the surface of the earth, and by the action of the atmosphere. Lastly, this salt is also obtained from the alum-slate of Dattwener, near Saarbrück, in the department of la Sarre, and from the alumiferous waters of Freyenwalde, in Brandenburg.

GLAUBER'S Salt, in *Chemistry and Materia Medica*. See *Sulphat of SODA*.

GLAUBER'S Spirit of Marine Salt. See *MURIATIC Acid*.

GLAUBER'S Spirit of Nitre. See *NITRIC Acid*.

GLAUBERITE, a lately discovered mineral, belonging to the class of salts, and of which M. Brongniart has given the description and analysis. This substance called glauberite by its discoverer, both in honour of the well-known Glauber, and on account of its containing a considerable quantity of the salt which bears the name of that alchemist, was found among pieces of rock-salt brought from Oaxaca in New Castile, in crystals resembling those of thumston, or axinite. They were (chiefly on account of their mode of occurring) mistaken in Spain for gypsum salts.

The form of these secondary crystals is that of an oblique

very short prism with rhomboidal base. The planes of the base are generally smooth and shining; the lateral planes striated parallel to the edges of the base. Cleavage double, the one parallel to the bases, the other less distinct and parallel to the edges of the base; in all other directions the fracture is vitreous. Hence the primitive form is an oblique prism with rhomboidal base, the obtuse angles of which correspond with the obtuse angles of the secondary prism. The crystals are from topaze yellow to nearly colourless; they are transparent, and, provided they are kept dry, preserve their transparency and solidity though exposed to the air. Their hardness surpasses that of sulphat, but is inferior to that of carbonat of lime.

Exposed to an intense heat, the glauberite decrepitates and melts into a white enamel. Immersed in water, its surface is covered by a milk-white crust, which penetrates deeper and deeper, till the whole crystal is white and opaque throughout: taken out of the water and dried, the white crust crumbles into dust, leaving the nucleus, if there be any remaining, unaltered and perfectly transparent. Specific gravity about 2.73.

From M. Brongniart's experiments it appears, that glauberite is essentially composed of anhydrous sulphat of lime and of sulphat of soda, equally anhydrous. 2. That these two salts exist in this substance nearly in the following proportions:

Anhydrous sulphat of lime	-	-	-	-	0.49
Anhydrous sulphat of soda	-	-	-	-	0.51
					—
					100
					—

A trace of water, indicated by the calcination, is not brought into account, as little as the accidental admixture of a scarcely perceptible quantity of iron, to which the yellowish colour of this substance appears to be owing.

Mr. B. adds the following observations: the above-mentioned pieces of salt from Ocana, which contain this substance, have generally some clay adhering, which penetrates into the strata of the surfaces, but seldom into the substance of the glauberite.

The efflorescence on glauberite, when moistened, and the property this salt possesses of becoming opaque in water, proceed from this, that the water, by dissolving the sulphat of soda, transforms the sulphat of lime into a spongy substance, and thus produces a phenomenon which is the reverse of that exhibited by the hydrophane.

The existence of native sulphat of soda, or Glauber salt, is well known to mineralogists, and, indeed, it has been met with in the neighbourhood of beds of rock-salt; but this was only as solution in the water of salt-springs, or as efflorescence near salt-mines: in a solid and crystallized state, entirely destitute of water of crystallization, and intimately united with selenite, it had never before been observed. Even the anhydrous sulphat of soda was almost entirely unknown, till Berthier proved that it constitutes nearly the fifth part of those hard scales found at the bottom of the pans in which the sea-salt is obtained by evaporation.

It remains to be ascertained, under which circumstances the rock-salt occurs which contains the glauberite, and particularly in what relation this latter stands to it, and whether it occur in the rents or on the surface of the beds. See Journal des Mines for 1808.

Häuy places the glauberite separately at the end of the *substances acidifères*; and it appears to this mineralogist, that the integrant molecules of the two salts of which it is composed exist together in the glauberite. He refers, for an analogous combination, to Leblanc's experiments, according

to which a solution of sulphat of copper and sulphat of iron mixed, yielded crystals composed of these two substances, while their primitive form proved to be that of the latter, which had impressed on this mixture the character of its particular crystallization. The question, therefore, is, whether the glauberite be in a similar case. Its form has, indeed, nothing in common with that of the anhydrous sulphat of lime; but we are totally unacquainted with the crystalline form of the anhydrous sulphat of soda. But even if it should be found that in this case the two molecules combine in such a manner as to produce a third of a different form from either, this circumstance could, according to Häuy's opinion, not be adduced as an objection against the theory of crystallization, and must be considered as a problem, the solution of which is more interesting to the chemist than to the mineralogist.

GLAUBOTTE, in *Geography*, a town of Prussia, in Natangen; 14 miles S.E. of Bartenstein.

GLUCEDO, in *Surgery*. See GLAUCOMA.

GLAUCHA, in *Geography*, a town of Saxony, in the lordship of Schonburg, on the Mulda, containing about 600 houses; the inhabitants are employed in the manufacture of stuffs; 46 miles W. of Dresden. N. lat. 50° 45'. E. long. 12° 25'.

GLAUCHE, a town of Germany, in the duchy of Magdeburg, adjoining to the town of Halle, but governed by its own magistrates; in which are four seminaries, where the languages, theology, mathematics, music, &c. are taught by 120 preceptors.

GLAUCION, in *Ornithology*, a species of *Anas*, the grey-headed duck. See DUCK.

GLAUCIUM, in *Botany*, is so named from its glaucous, or sea-green, colour. Whether the plant intended by Pliny be the Yellow Horned Poppy, according to the opinion generally received, or any maritime species of *Euphorbia*, seems a point not easily determined. Γλαυκίον of Dioscorides appears to be the juice of the first-mentioned in its wild state, though he compares it to his *μικρον κερδισιον*, (which is evidently the Yellow Horned Poppy itself,) saying the plant which yields the *γλαυκιον*, and grows at Jerusalem, has almost the leaves of the *μικρον κερδισιον*, but thicker, and spread on the ground, strong smelling, and more bitter, yielding plenty of saffron-coloured juice. Possibly this may refer to one of our other species of *Glaucium*, if not to the common wild *luteum*. Most commentators have taken *Argemone mexicana* for the plant of Dioscorides; but that is a tropical production, unknown in Europe, as we presume, previous to the discovery of America, though now naturalized in the East Indies; see ECHINUS. Neither does the above description suit this plant, for its leaves are much thinner than those of the Horned Poppy, and their juice pale yellow; nor are they spread on the ground. Matthioli seems to take the drug Gamboge for *γλαυκιον*, but this does not at all help us, as to the botanical question, nor has it any probability in its favour.—Tourn. Inst. 254. t. 130. Sm. Fl. Brit. 563. Prod. Fl. Græc. v. 1. 357. Juss. 236. Gärtn. t. 115. (Chelidonium; Linn. Gen. 262. Schreb. 350. Willd. Sp. Pl. v. 2. 1141. Lamarck. Illustr. t. 450. f. 2. Mart. Mill. Dict. v. 2.)—Class and order, *Polyandria Monogynia*. Nat. Ord. *Rhæadææ*, Linn. *Papaveraceæ*, Juss.

Gen. Ch. *Cal.* Perianth inferior, of two ovate, concave, bluntish, deciduous leaves, often tipped with a point near the summit. *Cor.* Petals four, large, roundish, slightly concave, nearly equal, with a shining spot near the base. *Stam.* Filaments numerous, shorter than the corolla, flat, incurved, rather dilated upwards; anthers erect, roundish, of two lobes. *Pist.* Germen nearly cylindrical, curved, longer than the

the stamens; style none; stigma with two or three lobes, downy. *Peric.* Pod linear, curved, very long, of two or three cells, and as many concave valves. *Seeds* numerous, globular, dotted. *Receptacle* linear, spongy, parallel to the valves, its surface cellular to receive the seeds.

*Eff. Ch.* Calyx of two leaves. Petals four. Pod superior, linear, of two or three cells and two or three valves. *Seeds* numerous, dotted.

*Obs.* This genus is very naturally distinguished from *Glabellium* by its habit, and essentially characterized by having more than one cell in its pod, and no cret to its seeds.

1. *G. luteum*. Yellow Horned-Poppy. Scop. Carn. v. 1. 369. Gærtn v. 2. 166 (*G. flore luteo*; Tourn. Infr. 254. *Chelidonium glaucum*; Linn. Sp. Pl. 724. Engl. Bot. t. 8. *Papaver cornutum, flore luteo*; Ger. em. 367)—Stem smooth. Stem-leaves rounded, waved. Pods roughish with minute tubercles. Flowers stalked.—Native of Italy, feathery throughout Europe, flowering in summer and autumn. *Root* perennial, tap-shaped. *Whole herb* roughish and very glaucous. *Stems* three feet high, spreading, branched, leafy, smooth. *Radical leaves* numerous, pinnatifid in a lyrate form; the rest rounded, wavy or fimbriated, alternate, sessile, clasping the stem. *Flowers* solitary, or axillary or terminal stalks, two inches broad, of a full shining yellow. Their calyx is hispid and deciduous, and the petals last but one day. The *pods* are often near a foot long, cylindrical, but compressed.

2. *G. fulvum*. Orange Horned-Poppy. Sm. Exot. Bot. v. 1. 11. t. 7. (*G. glabrum, flore phœniceo*; Tourn. Infr. 254? *Chelidonium corniculatum*; Donn. Cant. ed. 5. 131.)—Stem smooth. Stem-leaves rounded, waved. Pods rough. Flowers nearly sessile.—Supposed to be a native of the south of Europe, but we know it as a garden plant only. This differs from the former in the rather more blue cast of its herbage, nearly or quite sessile flowers, and smaller petals of a rich tawny orange-colour. We have thought the *root* annual, but we find it will survive a mild winter, about as well as the first species, which indeed is often killed, and never lives many years, at least in a garden. The *G. fulvum*, whether a distinct species or only a permanent variety, propagates itself by seed and remains unaltered. Its flowers, contracted with the leaves, have a singularly elegant effect. Their petals fall, in hot weather, before noon, but in the autumn will endure till the next morning, or longer, which is also the case when they are gathered and placed in a room.—If our quotation of Tournefort be right, our plant is figured in Lobel's *Icones* 271, f. 2, but not happily.

3. *G. rubrum*. Red Horned-Poppy. Sm. Prodr. Fl. Græc. v. 1. 357. (*G. orientale, flore magno rubro*; Tourn. Cor. 18.)—Stem hairy. Stem-leaves pinnatifid, cut. Pod slightly hairy.—Gathered by Dr. Sibthorp by the way-side between Smyrna and Bursa, as well as in the isle of Rhodes. The *root* seems to be annual. *Stems* spreading, or nearly prostrate, clothed with soft expanded hairs. *Stem-leaves* elongated, and deeply pinnatifid, by which it essentially differs from both the preceding, as it does from the following in the soft hairs, instead of rigid bristles, which clothe the pods and item. The *flowers* are stalked, with of ovate petals, narrower and flatter than in either of the former, of a tawny red, with a violet spot on the claw. Lobel's *Papaver corniculatum phœniceum alterum*, Ic. 271, f. 2, agrees with this rather than with the last in its petals, and somewhat in its leaves; but if Tournefort be correct, it cannot be designed for the present species, which he gives in his *Corolla* as different from all he had previously enumerated, including Lobel's plant.

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4. *G. phœniceum*. Scarlet Horned-Poppy. Sm. Fl. Brit. 964. Prodr. Fl. Græc. v. 1. 357. *Fl. Brit. t. 1. 121.* (*G. hircanum, flore phœniceo*; Tourn. Infr. 254. *G. corniculatum*; Curt. Lond. Infr. 6. t. 32. *Chelidonium corniculatum*; Linn. Sp. Pl. 724. *Papaver cornutum, flore phœniceo*; Lob. Ic. 271, f. 2.)—Found in cultivated fields in the south of Europe; a double variety of Linnæus, though easily naturalized. The *flowers* are double, opening in summer and autumn, and growing rather more numerous and busier than the last, from the greater distance of the double-pressed bristles, which in the former. The *pods* moreover are larger, reaching end of a ribbed cell, and each marked with a violet spot, bristles long and the spreading bristles, on the *pods*, are very different from the last kind of that species.

5. *G. viscerum*. Violet Horned-Poppy. Sm. Fl. Brit. 565. Prodr. Fl. Græc. v. 1. 358. (*G. flore violaceo*; Tourn. Infr. 254. *Chelidonium glaucum*; Linn. Sp. Pl. 724. Engl. Bot. t. 201.)—*Leaves* pinnatifid. *Pods* of three valves. Native or introduced in all parts of Europe; rare in England. The *stem* is annual, strongly branched, upright and hispid, a foot high, occasionally smooth, or clothed with spreading hairs, as is likewise the case with the *leaves*, which are twice, or even three, pinnatifid; their segments linear and acute. *Flowers* rather large, of a fine violet colour; their *pods* of three valves, though scarcely three-celled, except in an early stage of their formation.

GLAUCUM, in *Omniblogy*, a name given by Grasson to the *ANAS Fuligula* or tufted duck. See DUCK; and also to the *ANAS Marila*, or feap-duck. See DUCK.

GLAUCOMA, or GLAUCOSIS, a term, in *Surgey*, importing, with the Greeks, according to Mr. Samuel Sharp, what the Latin writers understand by *glaucoma*, and what we call a *catarrh*. This disease, as we have elsewhere explained, is an opacity of the crystalline lens. (See CATARRH.) Maitre-Jean, St. Yv., and other ophthalmists, however, think, that glaucoma is a disease complicated with the gutta serena, or an inflamed stage of the retina and optic nerve. (See GENIUM SANGUI.) The word is derived from *glaukos*, blue, the proper signification being the eye. Some writers have regarded glaucoma as a disease of the eye, originating from an opacity of the vitreous humour of the vitreous humour. Such a case is uncommon; but were an opacity of this kind to involve vision, an operation should be made to disperse it with small doses of calomel; and by exposing the eye to the vapour of ether. In the event of these means failing, the opacity might be broken and disturbed with a corneal-needle. The fungus humatodes of the eye must be detached. See FUNGUS.

GLAUCOPIS, in *Omniblogy*, a genus of the order PISCES. The bill is incurved and arched; the lower mandible shorter, and emarginate beneath at the base; the tarsi depressed, and half-covered with a firm cartilagenous membrane; tongue subcartilagenous, divided at the end, and ciliated; legs formed for walking; toes three before and one behind.

The only species of this extraordinary genus at present known, is the warlike bird of Dr. Forster, discovered in the Voyages of Captain Cook, and variously named in the later observations of other naturalists, and especially by the bird to the Ambradana regnum. Its bill is of a yellowish colour, the length from the tip to the base of the mandible. The bill remarkably strong, and of a black colour. The nostrils are situated near the base of the bill, and are half-covered by a membranous cartilage which falls over as a cover. Its wings

are pendent from the base of the lower mandible on each side, and in texture resemble the wattle of the common cock; the colour at first blue, and afterwards fine orange. The irides fine blue. From the forehead to the eye the colour is deep black: the other parts of the plumage dark ash-colour. The tail long, wedge-shaped, and composed of twelve feathers. Legs long, and the hind claw much longer than the rest.

This bird inhabits New Zealand, where it subsists on berries and insects, and is sometimes seen perched on trees, though rarely, as it is usually seen walking on the ground: its note is a kind of whistling or rather murmuring noise; and the flesh savoury and delicate.

GLAUCUM, in *Ancient Geography*, a promontory of the Libyan nome, on the confines of Marmarica and Egypt, upon which was a town of the same name. Ptolemy.

GLAUCUS, a river of the Peloponnesus, in Achaia, near Patras. Pausanias.—Also, a river of Asia Minor, in Lycia, having its mouth N. E. of the town of Telmissus, in the gulf of Glaucus.—Also, a river of Asia, in the territory of Colchis, where it discharges itself into the Phasis. Pliny.—Also, a gulf of Asia Minor, in a direction from N. W. to S. W. More anciently this gulf was denominated the gulf of Telmissus, from the name of the town, situated near its termination in the eastern part of it.

GLAUCUS, in *Ichthyology*, a species of *Chetodon*; which see.—Also, a species of *Scomber*.—Also, a species of *Falco*, which see respectively.

GLAUX, in *Botany*, so called by Pliny, and Γλαυξ by Dioscorides, is of uncertain derivation, though some have deduced its name from γλαυξ, milk. Most probably the word *glaucous* is similarly derived, as it conveys the idea of a milky green colour.—Linn. Gen. 114. Schreb. 159. Tourn. 60. Willd. Sp. Pl. v. 1. 1210. Sm. Fl. Brit. 268. Mart. Mill. Dict. v. 2. Lamarek Dict. v. 2. 722. Juss. 333.—Class and order, *Pentandria Monogynia*. Nat. Ord. *Calyceanthemae*, Linn. *Salicariae*, Juss.

Gen. Ch. *Cal.* none: unless the corolla be considered as such. *Cor.* of one petal, five-cleft, bell-shaped, erect, permanent, with obtuse revolute lobes. *Stam.* Filaments five, awl-shaped, erect, the length of the corolla; anthers roundish. *Pist.* Germen ovate; style filiform, as long as the filament; stigma capitate. *Peric.* Capsule globose, pointed, of one cell, with five valves. *Seeds* five, roundish; receptacle very large, globose, hollowed for the seeds.

Eff. Ch. Calyx of one leaf. Corolla none. Capsule of one cell, with five valves and five seeds.

1. *G. maritima*. Black Salt-wort. Linn. Sp. Pl. 301. Engl. Bot. t. 13. This is the only species known, being very frequent in salt-marshes throughout Europe, and flowering in summer. The root is perennial and creeping. Stem about four inches high, erect, somewhat branched, thickly covered with ovate, sessile leaves, and flesh-coloured, purplish, or whitish flowers. Dr. Withering has remarked that cows eat this herb, and that it is used for a pickle, being found every where from Lapland to the Archipelago. The description in Dioscorides, book 4. chap. 141. is so exact that it is impossible to be mistaken; yet we do not find this plant in the Prodomus Florae Graecae, because Dr. Sibthorp did not himself observe it in his journey.

GLAZIC, in *Geography*, a small island in the English Channel, near the coast of France. N. lat. 47 26. W. long. 2 56.

GLAZIER, an artificer or dealer in glass.

GLAZING. The Roman method of glazing some of their urns might give our workmen a hint toward a method greatly superior to any thing now in practice for the glaz-

ing of earthen-ware. There is a sort of red urns found in Yorkshire, which are, instead of glazing, covered all over inside and out with a fine coral-coloured varnish, that gives them a beauty, which no earthen-ware of our times can attain; and is not only far more durable than our way of doing it with lead, which is apt to crack and fly, both with wet and with heat, but far more safe and wholesome; and being well known to be a vapourable metal, and its fumes very noxious, there is great reason to suspect that it must be unwholesome when brought to the fire. This ancient glazing seems to have been done either by the brush, or else by dipping, for both the inside and outside are varnished with equal regularity; and something may be guessed at as to the materials they used in it, from what Pliny has left us. This author occasionally observes, that such earthen-ware as was painted with bitumen never lost its beauty; and afterwards, that it was a custom to cover over whole statues with this sort of glazing, which he observes did not only make a smooth coat, but sunk into the matter of the stone or earth, and therefore this could not be likely to crack and fly off like our lead-coats on plates, &c. which is merely a crust laid over them. Hook's Philos. Collect. p. 89.

A common glazing for any kind of earthen-ware may be made of white sand forty pounds, of red-lead twenty pounds, of pearl-ashes twenty pounds, and of common salt twelve pounds. Powder the sand by grinding it, and then add it to the other ingredients and grind them together: after which calcine them for some time with a moderate heat, and when the mixture is cold, pound it to powder; and when wanted for use, temper it with water. The proportion of these ingredients may be occasionally varied. We may observe, in general, that lead ought to be excluded from the composition of glazings, and other fluxes substituted in its stead. See *COLICA Damnoniorum*.

A transparent glazing may be prepared, without lead, by calcining forty pounds of white sand, twenty-five pounds of pearl-ashes, and fifteen pounds of common salt; and proceeding as before: and a more perfect transparent glazing may be made of sand forty pounds, of wood-ashes perfectly burnt, fifty pounds, of pearl-ashes ten pounds, and of common salt twelve pounds. The following recipes are taken, for the most part, from Kunckel, who says that they are the true glazings used at Delft, and other Dutch manufactories.

GLAZING, *Black*, is made of eight parts of red-lead, iron filings three, copper-ashes three, and zaffre two measures. This, when melted, will make a brown black; and if you want it blacker, add more zaffer to it.

GLAZING, *Blue*, is thus prepared: take lead-ashes, or red-lead, one pound, clear sand, or powdered flints, two pounds, common salt two pounds, white calcined tartar one pound, Venice or other glass half a pound, zaffer half a pound: mix them well together, and melt them for several times, quenching them always in cold water. If you would have it fine and good, it will be proper to put the mixture into a glass furnace for a day or two.

Another blue glazing may be formed of one pound of tartar, a quarter of a pound of red-lead, half an ounce of zaffer, and a quarter of a pound of powdered flints, which are to be fused and managed as in the last recipe. Or, take two pounds of calcined lead and tin, add five pounds of common salt, five pounds of powdered flints, and of zaffer, tartar, and Venetian glass, each one pound. Calcine and fuse the mixture as before.

Or, again, take of red-lead one part, of sand three parts, and of zaffer one part. For a violet blue glazing, take four

## GLAZING.

ounces of tartar, two ounces of red-lead, five ounces of powdered flints, and half a dram of manganese.

**GLAZING, Brown,** is made of red-lead and flints, of each fourteen parts, and of manganese two parts, fused: or, of red-lead twelve parts, and manganese one part, fused. A brown glazing, to be laid on a white ground, may be made of manganese two parts, and of red-lead and white glass, of each one part, twice fused.

**GLAZING, Flesh-coloured,** is made of twelve parts of lead-ashes, and one of white glass.

**GLAZING, Gold-coloured.** To make gold-coloured glazing, take of litharge three parts; of sand, or calcined flint, one part: pound, and mix these very well together; then run them into a yellow glass with a strong fire. Pound this glass, and grind it into a subtil powder, which moisten with a well saturated solution of silver; make it into a paste, which put into a crucible, and cover it with a cover. Give at first a gentle degree of fire; then increase it, and continue it till you have a glass, which will be green. Pound this glass again, and grind it to a fine powder; moisten this powder with some beer, so that by means of an hair pencil you may apply it upon the vessels, or any piece of earthen ware. The vessels that are painted or covered over with this glazing, must be first well heated, then put under a muffle; and as soon as the glass runs, you must smother them, by holding them over burning vegetables, and take out the vessels. Mr. Heinius of Peterburg, who sent this receipt to the Royal Society, uses the words *afflare debet sponam*, which is rendered *smother them*, in the Transactions. Phil. Trans. N<sup>o</sup> 465. § 6.

Kunckel gives several preparations for a gold-coloured yellow glazing. This may be produced by fusing a mixture of three parts of red-lead, two parts of antimony, and one part of saffron of Mars; by again melting the powdered mass, and repeating the operation four times; or, by fusing four or five times a composition of red-lead and antimony, of each an ounce, and of scales of iron half an ounce: or by calcining and fusing together eight parts of red-lead, six parts of flints, one part of yellow ochre, one part of antimony, and one part of white glass. A transparent gold-coloured glazing may be obtained by twice fusing red-lead and white-flints, of each twelve parts, and of filings of iron one part.

**GLAZING, Green,** may be prepared of eight parts of litharge, or red-lead, eight parts of Venice glass, four parts of brass-dust, or filings of copper; or, of ten parts of litharge, twelve of flints or pebble, and one of *as ystum*, or copper-ashes.

A fine green glazing may be produced by using one part of the Bohemian granate, one part of filings of copper, one part of red-lead, and one part of Venetian glass; or by fusing one part of white glass, the same quantity of red-lead, and also of filings of copper; powdering the mass, and adding one part of Bohemian granate to two parts of this powder. A fine green may be obtained by mixing and grinding together any of the yellow glazings with equal quantities of the blue glazings; and all the shades and tints of green will be had by varying the proportion of the one to the other, and by the choice of the kind of yellow and blue.

**GLAZING, Iron-coloured,** is prepared of fifteen parts of lead-ashes, or red-lead, fourteen of white sand, or flint, and five of calcined copper. This mixture is to be calcined and fused.

**GLAZING, Liver-coloured,** is prepared of twelve parts of litharge, eight of salt, six of pebble or flint, and one of manganese.

**GLAZING, Purple-brown,** consists of lead-ashes fifteen parts, clear-sand, or powdered flints, eighteen parts, manganese one part, and white glass fifteen measures; to which soon add one measure of saffer.

**GLAZING, Red,** is made of antimony three pounds, litharge, or red-lead, three, and rust of iron, one; grind them to a fine powder. Or take two pounds of antimony, three of red-lead, and one of calcined saffron of Mars, and proceed as before.

**GLAZING, Sea-green,** is made of five pounds of lead-ashes, one pound of tin-ashes, three pounds of flint, three quarters of a pound of salt, half a pound of tartar, and half a pound of copper dust.

**GLAZING, White.** A fine white glazing for earthen-ware is thus prepared: Take two pounds of lead, and one of tin; calcine them to ashes: of this take two parts, calcined tart, white sand, or broken white glass, one part, and salt one part: mix them well together, and melt them into a cake for use. The trouble of calcining the tin and lead may be prevented, by procuring them in a proper state.

The white glazing for common ware is made of forty pounds of clear sand, seventy-five pounds of litharge, or lead-ashes, twenty-six of pot-ashes, and ten pounds of salt: these see three times melted into a cake, quenching it each time in clear cold water. Or, it may be made of fifty pounds of clean sand, seventy of lead-ashes, thirty of wood-ashes, and twelve of salt.

A very fine white glazing may be obtained by calcining two parts of lead, and one part of tin; and taking one part of this mass, and of flints and common salt, of each one part, and fusing the mixture. See *DELF-WARE*.

A white glazing may be prepared by mixing one hundred pounds of mallicot, sixty-pounds of red-lead, twenty pounds of calcined tin or putty, and ten pounds of common salt; and calcining and powdering the mixture several times.

**GLAZING, Yellow,** is prepared of red-lead, three pounds; calcined antimony and tin, of each two pounds; or, according to some, of equal quantities of the three ingredients. These must be melted into a cake, then ground fine; and this operation repeated several times: or, it may be made of fifteen parts of lead-ore, three parts of litharge, of silver, and fifteen parts of sand.

A fine yellow glazing may be procured by mixing five parts of red-lead, two parts of powdered brick, one part of sand, one part of the white glazings, and two parts of antimony, calcining the mixture and then fusing it. Or, take four parts of white glass, one part of antimony, three parts of red-lead and one part of iron scales, and fuse the mixture: or, fuse sixteen parts of flints, one part of iron-filings, and twenty-four parts of litharge. A light yellow glazing may be produced with ten parts of red-lead, three parts of antimony, and three of glass, and two parts of calcined tin. See *GOLD-COLOURED GLAZING*.

**GLAZING, Citron-velvet,** is made of six parts of red-lead, seven parts of fine red brick-dust, and two parts of antimony. This mixture must be calcined day and night for the space of four days, in the ash-hole of a glass-house furnace, and at last urged to fusion.

**GLAZING of Delf-ware.** See *DELF-WARE*.

**GLAZING of Porcelain.** See *PORCELAIN*.

**GLAZING of Stone-ware, and Queen's ware.** See *PORCELAIN*.

**GLAZING for Tobacco Pipes.** See *TOBACCO-PIPES*.

**GLAZING, in Painting,** a term of the art, expressive of a peculiar mode or variety in the practice of it. It consists in laying a transparent colour, made very thin by a great quantity of oil, or other vehicle, over a solid body of any colour.

colour; and its intent is, to give a greater degree of clearness and brilliancy to the colour produced by this process, than can be obtained by mixing together in substance the two colours thus employed. In this mode their hues are blended, without disparagement of each other; whereas, in mixing them in the ordinary way, a certain diminution of their brilliancy takes place, produced by the dissimilar nature of their qualities.

Glazing appears to have been practised very early in oil-painting; and probably the use of varnishes over pictures painted with water-colours may have first shown its utility. Indeed it could not fail to be the case, if the varnish employed happened to be tinged with any colour; for the lustre pictures acquired by that circumstance must be strikingly engaging: a harmony and sweetness are thereby gained, which all other means are vainly employed to obtain. It is therefore surprizing that all those who practised the art of painting after the discovery of the use of oil, should not have given in to the application of it. Yet it is certain that the Roman school is remarkably deficient in the knowledge of the value of this practice, and most frequently neglected to use it; owing probably to the employment painting found in fresco. The Venetian and Dutch schools, on the other hand, employed it in perfection, and it is in their works that a knowledge of it may best be acquired.

The principal difficulty attending the use of glazing, is to avoid the too common application of it; as it does not suit the representations of all substances, in its more immediate sense; though one general glaze over a picture, completed in its forms, will at all times benefit the work; if it happens not to be too low, or insipid, in its tones of colour.

All kinds of gems and polished substances, such as metals, silks, velvets, &c. are imperfectly wrought to effect, when it is not employed; and flesh, which is in nature compounded of a great variety of colours, is seldom quite perfect in its hue, when glazing is not employed to finish with. It is a species of it, produced by the yellow varnish being but partially removed from old pictures, which gives them their peculiar and brilliant lustre. It is quite impossible to make any effect exactly like it with fresh colours, unless some artifice be used to fore-run the effects of time; such as rubbing in dirt, and then partially removing it, &c. tricks which picture dealers are perfectly conversant with; and by which many an ingenious copy is passed off upon the unlearned amateur, to the enrichment of the dealer, and the future annoyance of the buyer, when time and improved information let him into the secret.

Glazing is the most valuable part of the practice of painting, when judiciously employed; as it produces clear broken tones of colour, which leave no room for trace of the palette, but deceive the eye by the variety of hues, and dazzling effect of light, produced by one colour shining through another in different degrees of illumination; much more like the effects of natural objects, than the use of opaque colours can possibly produce. But then great dexterity and judgment are required to use it properly in so general a manner. A well-informed and scientific artist knows the tone which one colour glazed over another will produce; and without that knowledge, a dirty dulness may be the effect, instead of the clearness required; and if not successful, it is always injurious; there is no medium in the application of it. If the under colour is not improved, it is sure to be deteriorated; and it will require repainting, to restore its original freshness. So that when a painter has prepared a work for glazing, (which should always be done with great clearness and precision,) the most extreme caution is requisite in adapting the tone of the glaze

which he proposes to use to the general hue of the picture before he applies it. It is not possible to give rules more explicit on this matter; the indefinite subdivisions of hues which all colours are capable of, must for ever leave to the feeling and judgment of the artist their peculiar application. It is hardly necessary to state that a glaze of red, over blue, will produce purple; of blue, over yellow, green; and of red, over yellow, orange; but it may aid the student in his practice, if he considers, that all the varieties of tone the original colours are capable of, will, when equally employed, produce a corresponding compound; and, of course, if his picture be of too red a hue, though of a light tone, a corresponding one of blue, or of yellow, will change it to the one he may require; and if he use the blue and yellow together as a green, it will produce a negative colour; totally destroying the red; but the varieties are too complicated and numerous to follow.

*Glazing of Cloth.* The process of glazing is used for all the stout fabrics of cotton goods, and sometimes for those of linen. It is a part of the general processes of finishing goods for the market, and which is carried on by those who are generally called cloth-lappers, or calendermen. The glazing is done by putting on the cloth a small quantity of white wax, such as that used in the manufacture of wax candles, and the gloss is afterwards effected by the friction of any smooth body on the surface of the cloth. By the ordinary process the apparatus is very simple, consisting merely of a smooth table, a little inclined towards the operator, like a common writing desk, upon which the cloth to be glazed is spread smoothly, and drawn over, as occasion requires, from one end of the piece to the other. Above this is a lever, suspended from any convenient fixture to the roof, the lower end hanging in contact with the cloth, and by moving this backward and forward, the necessary friction is produced. The end of the lever next to, and in contact with the cloth, is faced with a smooth piece of flint or pebble, finely polished, and of a cylindrical form, the under surface of which is in contact with the cloth. This lever being drawn backward and forward by the operator's hands, the whole cloth is polished or glazed in succession, the joint at the top of the lever being fitted into a horizontal slider, which allows the polisher or flint to be moved from one side of the cloth to the other. In this way of glazing, the whole is performed by the power of a man's arms and hands; and, from the position of his body being constantly inclined over the table, is found to be a very laborious and fatiguing operation. The great number of people necessarily employed by this operation, and the difficulty of getting large quantities of goods rapidly glazed to answer the demands of hurried shipments for exportation, suggested lately the idea of a more speedy and efficacious manner of performing the operation of glazing by an improvement and alteration in the construction of the common five-owl calender. This improvement was planned and executed at the extensive works of the late Mr. John Miller of Glasgow, who furnished the inventor with the means of carrying his plan into effect, and upon a proof of its efficacy on trial, his majesty's royal letters patent for its exclusive use to the inventor or his assigns within Scotland were obtained in the usual form. Two or three machines were then constructed for his own works, to which, as far as we know, they are still confined; and these machines have given the most universal satisfaction to all who have had their goods glazed by them, while at the same time an immense reduction of labour has been effected by their use.

The patent glazing machine, like the common calender, consists of five bowls, or cylinders, four of which are of cast



cast iron, smoothly turned, and finely polished on the surface, and the large or intermediate cylinder is generally of pitch-board on an iron axis. In the common operation of smoothing by means of the calender, the velocity of the cylinders revolving upon their own axes, is in the ratio of their respective diameters, so that an equal quantity of superficies is constantly exposed of each. In the glazing-calender, or machine, it is only necessary that the motions of one of the cylinders should be so much accelerated as to produce the friction necessary to effect the glazing by rubbing against the other cylinders with which it is in contact, so as not to be liable to tear or otherwise injure the fabric. This motion is produced by means of wheels placed in the following manner: On the axis of the main cylinder A, is a cast iron wheel of any convenient diameter and number of teeth. This wheel works into the stud-wheel B, the number of whose teeth is not material to the speed, and whose diameter may be regulated so as to pitch well into the remaining wheels. The wheel is placed to revolve loosely on an iron stud, screwed into the frame-work of the machine. The stud-wheel B gives motion to the second stud-wheel C, and it continues the motion to the wheel D, which is fastened on the axis of the first iron cylinder. The upper cylinder works merely by friction, as in a common calender, and when the intermediate stud-wheel B is removed by being taken off the stud, the whole cylinders will revolve exactly as in the common machines, without producing any glazing effect. The simplicity of this machine, the regularity of the gloss which it gives, and the immense saving of labour, are powerful recommendations in its favour. The great quantity also which may be effected by it in a very limited time, renders it peculiarly adapted to meet the occasional exigencies of the exporter; and the additional advantage of its facility of adaptation to the purposes of the common calender, when glazing is not required, adds to its value and utility. Upon pressing occasions, one of these engines, by being constantly employed night and day, will glaze from 600 to 800 pieces of cloth, of 28 yards each, weekly.

Those employed in the late Mr. Miller's works are driven by means of a steam engine, by which also various other kinds of machinery, adapted to the various operations of the business, are set in motion. Should any machinery of this description be constructed in works where there may be a general necessity of keeping them constantly employed for the purpose of glazing, it will be very necessary that care should be taken that the moving power, whether water, steam, or horses, should be ample; as it must be evident, even to those who are not practically conversant with the calculation of power and resistance, that this calender, when employed to glaze, must require considerably greater force to keep it in motion, than when the cylinders revolve in the ratios of their diameters, for the mere purpose of common calendaring or smoothing.

We are not in possession of sufficient *data* to enable us to ascertain, with any tolerable precision, the quantum of resistance added by the friction; nor are we aware that any accurate experiments have been made for that purpose: But it is evident that it must be very great in all cases. It is reasonable also to infer, that it may be considerably increased or diminished by the texture or fabric of the stuff upon which the glazing operation is performed. Hence, if these machines be employed constantly in large works, and set in motion by the same power, which also drives machinery adapted to other purposes, care must be taken that the power be sufficient to effect all the various purposes to which it is applied. And should this be attempted, under the impression that the glazing might be performed by the same power as common calendaring,

ing, a deficiency would be found, which must render it necessary to disengage part of the machinery, in order to give sufficient momentum to the rest. Thus, perhaps, one of the most common, and at the same time, most ruinous errors into which the projectors of large works, who are not mechanics, are apt to fall. In the first instance, desirous that a large establishment should be set to work at the least possible expence, they too frequently calculate too barely, and are then obliged either to abandon their whole scheme at a great loss, to work it under serious and ruinous inconveniences, or to repair, at a triple expence, what they have first deficient at first.

GLEAZOV, in *Geography*, a town of Russia, in the government of Viatka, on the Tchevtza; 56 miles E. S. E. of Viatka. N. lat. 58° 5'. E. long. 54'.

GLEAD, or GLAID, in *Ornithology*, a name used in the northern parts of the kingdom for the *milvus, or accipiter, Falco Milvus*.

GLEAM is popularly used for a ray or beam of light. Among falconers, a hawk is said to gleam, when she casts or throws up filth from the gorge.

GLEAN, in *Geography*, a river of England, which rises about four or five miles N. of Stamford in Lincolnshire, and runs into the estuary called the Wash, five miles N. E. of Spalding.

GLEANNING, the act of gathering or picking up the ears of corn left behind, after the field has been reaped, and the crop carried home.

By the customs of some countries, particularly those of Meulan and Eilampes, all farmers and others are forbidden, either by themselves or servants, to put any cattle into the fields, or prevent the gleaming in any manner whatever, for the space of twenty-four hours after the carrying off the corn; on penalty of confiscation, &c. It hath been said, that by the common law and custom of England the poor are allowed to enter and glean upon another's ground after the harvest, without being guilty of trespass. *Gilb. Jo. 253. Trials for fair*, ch. 15. 438. This humane provision seems to be borrowed from the Mosaic law. *Levit. xix. 9. xxiii. 22. Deut. xxiv. 19, &c.*

Gleaning is a practice that is little heard of in the more northern parts of the kingdom, but which prevails greatly in some of the southern districts. The custom is of great antiquity; and whether or not the poor have any legal right, in this country, to glean, except by the express permission of the farmer, it has however been long sanctioned by its continuance, that it is but rarely interrupted or put a stop to by law.

In some places where it is carried on to excess, it would seem necessary for the farmers to make regulations in respect to it, that should not be broken through on any account whatever. If this be not the case, the abuse is frequently so great that they are much injured by it, "as the poor glean among the sheaves, and too often from them," as is not only to those who have attended to the practice. It has been therefore suggested to make it a rule not to harrow a gleamer to enter a wheat field until it is wholly cleared of the crop, which would, no doubt, prove a very beneficial regulation. It does not, however, upon the whole, appear that much benefit is derived to the poor from this custom, which evidently leads to idleness, inactivity, paupering, and a variety of other evils of disposition.

GLEBA ALANA, a name by which some call the yellowish white tripholi.

GLEBA, *Arabi.* In the civil law, slaves were said to be annexed to the glebe; *id est*, they were sold with it, &c.

The right of patronage should be annexed to a glebe.

GLEBE, *GLEBA*, in *Natural History, Chemistry, &c.* a clod, or piece of stone or earth, frequently containing some metal, or mineral.

The glebes are carried to the forges to be washed, purified, and melted, &c.

GLEBE, or *Glebe-land*, is properly used for church-land; "Dos vel terra ad ecclesiam pertinens"

Glebe-land is most commonly used for land belonging to a parish-church, beside the tithes.

Thus, Landwood: "Glebe est terra in qua consistit dos ecclesiæ; generaliter tamen sumitur pro solo, vel pro terra culta." Though in the most general, and extensive use of the word, glebe is applicable to any land or ground belonging to any benefice, fee, manor, inheritance, or the like.

If any parson, vicar, &c. hath caused any of his glebe lands to be manured and sowed at his own costs, with any corn or grain, the incumbents may devise all the profits and corn growing upon the said glebe by will. (Stat. 28 H. 8. cap. 11.) And if a parson sows his glebe and dies, the executors shall have the corn sowed by the testator. But if a glebe be in the hands of a tenant, and the parson dies after severance of the corn, and before his rent due; it is said, neither the parson's executors nor his successor can claim the rent, but the tenant may retain it and also the crop, unless there be a special covenant for the payment to the parson's executors proportionably, &c. Wood's Inst. 163.

GLEBEC, in *Geography*, a town of America, in the state of Virginia; 10 miles S.E. of Tappahasoc.

GLEBOUS, in *Rural Economy*, a term sometimes provincially signifying the turf or grassy surface.

GLEBOW, in *Geography*, a town of the duchy of Courland; 18 miles S. of Mittaw.

GLECHOMA, in *Botany*, is derived from Γλεχων of Dioseorides, though the latter is usually taken for *Pulegium*, or Penny-royal.—Linn. Gen. 291. Schreb. 388. Willd. Sp. Pl. v. 3. 85. Mart. Mill. Dict. v. 2. Sm. Fl. Brit. 625. Juss. 113.—Class and order, *Didynamia Gynnospermia*. Nat. Ord. *Verticillata*, Linn. *Labiata*, Juss.

Gen. Ch. *Cal.* Perianth of one leaf, tubular, cylindrical, striated, very small, permanent; its mouth having five sharp unequal teeth. *Cor.* of one petal, ringent; tube slender, compressed; upper lip erect, obtuse, lower lip spreading, larger than the upper one, obtuse, three-cleft, its middle lobe larger, emarginate. *Stam.* Filaments four, under the upper lip, two of which are shorter; each pair of anthers forming themselves into a cross. *Pist.* Germen four-cleft; style thread-shaped, bending under the upper lip; stigma cloven, acute. *Peric.* none; the calyx nourishing four, ovate *Acids* in its bosom

Ess. Ch. Calyx five-cleft. Each pair of anthers converging in form of a cross.

1. *G. hedraea*. Ground-ivy. Linn. Sp. Pl. 807. Engl. Bot. t. 853 — "Leaves kidney-shaped, crenate."—Found in woods and hedges, flowering in April and May. *Root* perennial, and creeping. *Leaves* on foot-stalks, dotted beneath with glandular points. *Flowers* axillary, about three to each leaf, prettily speckled with white and blue. *Calyx* striated. *Anthers* white. Ground-ivy has been so long and so generally known, that it has obtained various appellations, such as Ale-hoof, Gill, Robin-run-in-the-hedge, Cat's-foot, &c. Before the introduction of Hops its leaves seem to have been used for flavouring and clarifying ale. Gerarde has enumerated a long train of "Vertues" supposed to be possessed by this plant; and when infused into tea or honey, it is still a favourite medicine with the common people for coughs. Many animals eat it, though it is said to injure

horses if taken too copiously. The specific character is now superfluous, as two species enumerated in the first edition of the *Species Plantarum* are now referred to other genera.

GLECHOMA *Hedraea*, ground-ivy or gill, in the *Materia Medica*, is a well known plant, growing commonly under hedges and flowering in April. Ground-ivy has a peculiar strong smell; the leaves, according to Dr. Withering, being beset underneath with hollow dots, in which are glands secreting an essential oil, and above with little eminences, which do not secrete any odiferous oil; for this surface, when rubbed, yields no peculiar scent, whereas the under surface affords a pleasant reviving scent. The taste is bitterish, and somewhat aromatic. This plant was formerly supposed to possess great medicinal powers, not discovered by later experience; accordingly it is omitted in the *materia medica* by the London college. Its qualities have been described by different authors, as pectoral, detergent, aperient, diuretic, vulnerary, corroborant, errhine, &c. and it has been recommended for the cure of those diseases to which these powers seem to be most adapted, but chiefly in pulmonary and nephritic complaints. In obstinate coughs it is a favourite remedy with the poor, who, probably deriving benefit from it, persist in its use. Ray, Mead, and some others, speak of its being usefully joined with fermenting ale; but Dr. Cullen observes, "it appears to me frivolous. In short, in many cases where I have seen it employed, I have had no evidence either of its diuretic or of its pectoral effects. In common with many others of the *verticillata*, it may be employed as an errhine, and in that way cure a head-ache, but no otherways by any specific quality." It is usually taken in the way of infusion, or decoction, as tea. Woodville Med. Bot.

GLECHONITES, a name given by the ancient *Physicians*, to a sort of wine impregnated with penny-royal, much recommended in all obstructions. It takes its name from *glechon*, the Greek name of penny-royal, or *pulegium*.

GLEDITSIA, in *Botany*, named by Clayton, and adopted by Linnæus, in honour of Dr. John Gottlieb Gleditsch, professor of medicine and botany at Berlin, an advocate of Linnæus against Sigesbeck, and author of a *Systema Plantarum*, founded on the insertion of the stamens, as well as of an arrangement of *Fungi*, and various other botanical treatises in Latin and German. He died in 1786, aged 72. Linn. Gen. 549. Schreb. 735. Ait. Hort. Kew. v. 3. 444. Mart. Mill. Dict. v. 2. Juss. 346. Lamarck Illustr. t. 857. Gærtn. t. 146. Class and order, *Polygamia Diœcia*; or rather *Diœcia Hexandria*. Nat. Ord. *Lomentaceæ*, Linn. *Leguminosæ*, Juss.

Gen. Ch. Male. *Cal.* Perianth of three small, spreading, acute leaves. *Cor.* Petals three, roundish, sessile, spreading, resembling the calyx-leaves. Nectary turbinate, united by its border to the other parts of fructification. *Stam.* Filaments six, thread-shaped, longer than the corolla; anthers oblong, compressed, two-lobed, incumbent.

Female, on a separate plant, *Cal.* Perianth like the male, but of five leaves. *Cor.* Petals five, long, acute, rather spreading. Nectaries two, short, like abortive filaments. *Pist.* Germen superior, broad, compressed, longer than the corolla; style short, reflexed; stigma thick, the length of the style, to which it is longitudinally affixed, downy in the upper part. *Peric.* Legume very large, broad, compressed quite flat, divided by numerous transverse partitions, and filled with pulp. *Seeds* solitary, roundish, hard, and polished.

At the summit, generally, of the male spike is an united flower, with four calyx-leaves and as many petals, with a nectary and stamens like the male, but with a pistil, producing perfect fruit, as in the female. Hence Linnæus referred this genus to his class *Polygamia*, but if it remains there

there it must rather be on account of the difference of structure in its male and female flowers, than for their slight sexual anomalies. Even for this difference of structure we should rather place it in *Diacia*. See Sm. Introd. to Botany, 479, 485.

Obf. This genus has considerable affinity with *Ceratonia*, especially in the fruit. We cannot apply the term *amentum* to its inflorescence, which is a spike.

Ess. Ch. Male, Calyx of three leaves. Petals three. Nectary turbinate. Stamens six.

Female, Calyx of five leaves. Petals five. Nectaries two. Pencil one. Legumens.

Some flowers united, four-lobed.

The species of *Gleditsia* are as yet a mass of confusion. *G. triacanthos*, Linn. Sp. Pl. 1509, the original one, a native of North America, was cultivated by bishop Compton in 1700, and is a tall handsome tree, which bears our climate well, except being sometimes broken, like *Robinia Pseudo-acacia*, by strong winds. It is remarkable for its large trifid or compound spines, which grow on the trunk to the length of six or eight inches, from a very slender base. The leaves are deciduous, bipinnate, large, consisting of innumerable elliptical, slightly toothed, nearly smooth leaflets, half an inch or near an inch long. Flowers greenish, in axillary spikes. Some leaves appear to be simply pinnate, but we know not whether this is a specific difference or not.

A very distinct species is cultivated with us by the name of *G. chinensis*, which Linnaeus also had at Upsal, but he does not seem to have described it. The spines are compound. Leaves simply and abruptly pinnate, of seven or eight pair of thin, squarish, unequal-sided, crenate leaflets, gradually larger upwards, the terminal pair being sometimes twice the dimensions of the next.

In Sion gardens, belonging to the duke of Northumberland, is a tree of another species, of which we find no mention. Its leaves are simply pinnate like the last, and the leaflets also gradually larger upwards, but they are coriaceous, elliptical, their sides very seldom unequal. The calyx-leaves and petals are narrower, shorter, and blunter than in *G. triacanthos*. Of its spines we have no account, but the leaves and flowers were communicated to us by Mr. Hoy, in August 1796, as a *Gleditsia* not in the *Hortus Kewensis*, where, indeed, all that are known are made varieties of the *triacanthos*. From the new edition of this valuable work perhaps more information may be expected.

*G. inermis*, first mentioned by Linnaeus in the second edition of Sp. Pl. 1509, seems to have been adopted without a specimen, from Plukenet's t. 123 f. 2, to which is added Miller's t. 5, which last represents a *Simonsia*, nor does any subsequent writer appear to know any thing of this species.

It would be a tedious and unprofitable talk to attempt a determination of the synonyms of this genus, even if the species were defined. The latter is a desirable object, and worthy the attention of those who have perpetual access to the old botanic gardens about London, and can observe these trees at different periods of growth. It is necessary to determine whether the simply or doubly pinnated leaves mark a specific distinction; whether the spines vary according to the age of the tree; and whether the legume is, in any species, constantly single-seeded, or merely from accidental abortion. Travellers in America can scarcely be expected to throw any light on such botanical questions as these, though a careful observer, resident there, might render highly important services to botany, and to the most useful arts of life, by determining first the specific differences, and then the economical qualities, of all the American trees, among which the *Gleditsia* claim a distinguished place. The

labours of a Lambert among the Pines, and a Miller among the Oaks, are models for future enquirer.

GLEDISIA, in *Gardening*, comprehends a plant of the deciduous tree or shrub kind; of which the species usually cultivated is the three-thorned acacia (*G. triacanthos*), which seldom rises higher than a shrub in this country.

There are several varieties with different numbers of spines, and with stronger and weaker spines.

*Method of Culture*—These trees are capable of being increased by sowing the seeds, which are obtained fresh from America, in a bed of light earth, in the early spring season, watering them occasionally when the season is dry. It is, however, a much more expeditious practice to sow them in pots, and plunge them in a moderate hot-bed. The plants should be kept clean during the first summer after they appear, and in the succeeding winter be well protected from severe frosts, especially such as are in pots.

The young plants may, most of them, in the following spring, be removed and set out into nursery rows, at a foot or eighteen inches distant from each other, and eight or ten inches in the rows. Such small plants as remain, may be put out in the same manner in the next autumn or spring.

The plants should continue in this situation till they have had two or three years growth, after which they may be transplanted into the situations in which they are to remain any time towards the latter part of the spring season.

These plants are found to succeed best in situations where the soils are of the more light deep kinds, and rather sheltered from the inclemency of the atmosphere.

They are all very ornamental trees, and well adapted to large shrubberies, plantations, and pleasure grounds. When planted alone, on lawns, and large open spaces that are kept in short grass, they produce a fine appearance. They have, however, the disadvantage of putting forth their leaves at rather a late period.

GLEE, a musical term derived by Skinner, Junius, Johnson, and all the etymologists, from  $\text{glæ}$ , Saxon, joy, mirth, sport.

His merry men commanded he  
To make him both game and glee.

Chaucer, Rim. S. Tap. v. 125.

The term, we believe, is not to be found in music-books, or musical writers, before the middle of the 17th century. The first time it appears in the title of a collection of canons, rounds, and catches, is in a publication by John Playford, 1667, under the title of "Dialogues, Glee, Ayres, and Ballads, of two, three, and four Voyces."

A glee in music implies nothing more in its original sense, in our printed music-books, than "a song of three or more parts, upon a gay or merry subject, in which all the voices begin and end together, singing the same words." When subjects of fugue or imitation occur, and the composition is more artificial than simple counterpoint, it less resembles a glee than a madrigal, which it might, with more propriety, be called, if the words are serious; for a serious glee seems a solecism, and a direct contradiction in terms. The word glee, in Saxon, German, and English dictionaries, ancient and modern, implying mirth, merriment, and in Chaucer and other old authors, music itself.

GLEET, in *Surgery*, commonly signifies the continuation of a thin discharge from the urethra, after the inflammatory symptoms of a clap have for some time ceased. However, the running which takes place from the urethra, in cases of strictures, diseased prostatic gland, &c. is also frequently called a gleet. A mere gleet, unattended with any other disease of the parts, is not accompanied with the remarkable pain

pain and scalding sensation in making water, which are produced by gonorrhoea. The latter affection may be considered as *acute*, while the gleet is quite of a *chronic* nature. It was one of the opinions of Mr. Hunter, that a gleet differed from a gonorrhoea, likewise, in not being infectious. It is well known that it was one of the doctrines of this eminent surgeon, that the poison of gonorrhoea, and that which is productive of lues venerea, are of the same quality, and that the different effects are owing to the different structure of the parts concerned in the two diseases. We need not here enter into an investigation of this part of the subject. All that we wish to observe is, that if Mr. Hunter meant, when he states, that a gleet differs from a gonorrhoea in not being infectious, that a gleet is *not capable of communicating the venereal disease*, no one can question the accuracy of the observation. But, on the contrary, if the assertion implies that the matter of a gleet, when applied to the pudenda muliebris, will not bring on a pain in making water, a discharge, &c. then we dissent from the opinion altogether. We have known an instance, in which a gentleman, who had had a gleet upon him for upwards of a year, and who, on the presumption that it was not infectious, ventured to have connection with a young woman, of whose continency, with regard to other men, we ourselves entertain no doubt. However, there may be gleets of various kinds, and some of them may be infectious, and others not so. When, after a gonorrhoea, a thin discharge continues, for a long while, to take place from the urethra, the complaint may depend upon a weakness of the vessels, or, as Mr. Hunter expresses it, upon a habit of action, which the parts have contracted. When a gleet arises from a stricture in the passage, or from a disease of the prostate gland, the cause must be referred to irritation, and the cure depends on the removal of the original complaint.

Gleets, which are the consequence of gonorrhoea, are often exceedingly difficult of cure, and what is very curious, it frequently happens, that, after they have resisted every sort of remedy, and after the patient has long given up the use of medicines and injections, a sudden cure spontaneously occurs. Many gleets undergo a temporary stoppage under particular modes of treatment; but, as soon as this is removed, regularly return again. A vast number of gleets depend upon the presence of a stricture in the urethra, and of course are not curable by injections. We have often thought that in all cases of gleets, it should be the invariable custom of the surgeon to introduce a bougie, for the purpose of ascertaining whether there is any obstruction in the passage; for, when the discharge depends on a stricture, the patient might make use of balsams, turpentine, and bougies, for years, and yet receive no benefit whatever. At all events, whenever a gleet resists ordinary means, the state of the urethra and of the prostate gland ought to be examined. See PROSTATE GLAND, *Disease of*; and STRICTURE.

Mr. Hunter was of opinion, that the spontaneous disappearance of a gleet, after a long resistance to every sort of medicine and application, very frequently depended upon accidental changes in the patient's constitution. It was another sentiment of this celebrated surgeon, that some gleets were connected with scrofala. This idea is founded on the circumstance, that more gleets may be cured by sea bathing, than any other kind of bathing. It is also supported by the fact, of sea water being sometimes an effectual means of cure, when employed as an injection.

We have always found fault with this plan of judging of the nature of diseases. If a disorder yields to mercury, practitioners are apt to decide immediately, that the complaint is venereal. If a malady, like a gleet, gives way to

sea bathing, which benefits scrofulous complaints, such as syphilis, as reason on Mr. Hunter's principles, will immediately set down the case as scrofulous. It is never remembered in this calculation, that mercury cures many diseases besides the venereal; and that sea bathing cures many complaints besides those which are of a scrofulous nature.

Gleets have also been represented as always connected with a relaxed constitution, though we think we have seen the complaint in subjects, who were strong, robust, and young, with an appearance of general health, and whose state seemed to us a striking contradiction to the foregoing observation.

Cures, as we have before stated, are often exceedingly difficult of removal. Sometimes, indeed, they may be got rid of with tolerable ease; but in other instances, they completely frustrate the efforts of surgery, and the patient, tired of the inefficacy of different remedies, relinquishes the trial of all. In slight cases, and occasionally in inveterate ones, a cure may be effected by exhibiting internally the balsam of copaiva, the oleum terebinthinæ, or the tincture of lyttæ (cantharides). It is well worthy of notice, that when a cure can be accomplished by these means, benefit is soon derived from their employment. For this reason, when they neither diminish, nor remove the gleet in the course of five or six days, Mr. Hunter made it a rule never to continue their use any longer, but have recourse at once to other methods. We have already remarked the great tendency of many gleets to return, after being for a time stopped by different modes of treatment. Hence practitioners should never discontinue the successful plan immediately the discharge ceases, but persist in its adoption for ten days or a fortnight, after all the symptoms have entirely gone off.

In relaxed habits gleets are very likely to be cured by the cold bath, sea bathing, bark and steel medicines. Cold bathing indeed often succeeds in every kind of constitution, when other methods are of no avail. We have known strong young men labouring under gleets, who could not get rid of them in any way in London; but who got well almost immediately on going to the sea-bath, and bathing there. There can be no doubt also, that some beneficial revolution in the system, arising from the change of air, might have a considerable share in the cure. We lately had under our care a gentleman with a gleet, which had lasted nine months, but disappeared all at once on the patient going for a short time to a part of the country which was not near the sea.

There are two principal kinds of injections in use for the cure of gleets, *viz.* astringent and irritating ones.

The astringent ones are, for the most part, such as the decoction of bark, and solutions of zincum vitriolatum, alum, or acetite of lead. An injection of proper strength, containing cuprum vitriolatum, bolus gallicus, and camphor, is also an exceedingly eligible one.

The best irritating injection which we know of, is that made by dissolving two grains of the hydrargyrus muriatus in eight ounces of distilled water.

Bougies may also be considered as acting on the urethra as irritating applications, and hence they are occasionally recommended to be worn for the cure of gleets. In general, common bougies are employed; but sometimes others, medicated with camphor or turpentine, are used.

In irritable constitutions, the latter kind of injection and the bougies may excite a good deal of irritation, pain, strangury, &c. so that some circumspection is necessary in the employment of such means. We may state, indeed, that no endeavour should ever be made to cure a gleet, by exciting irritation in the urethra with stimulating injections, or bougies, before milder means have failed. We have found a weak

weak injection of the hydrargyrus muriatus more frequently successful than any other. One grain to six ounces of water is quite strong enough to begin with, and the strength may be gradually augmented, in proportion as the urethra appears capable of bearing it. The practitioner must not leave off the injection as soon as the discharge ceases; for if he does so, the gleet will generally recur. The plan should still be followed up for about a fortnight.

When gleets are to be cured by bougies, it is necessary to wear these instruments about a month or six weeks before any dependence can be put in the permanence of the cure.

Neither the surgeon nor the patient should be deterred from persisting in the trial of irritating injections or bougies, by the circumstance of their appearing to increase the discharge at first. This they always do.

Mr. Hunter thought that moderation and regularity in diet were conducive to the cure of gleets. So is a quiet kind of life in the generality of cases, but there are instances in which gleets seem to be benefited and cured by rough exercise on horseback.

A return or an increase of a gleet is very apt to be the consequence of intercourse with women, and the patient often thinks that he has received a fresh infection. Mr. Hunter thought that the case might be discriminated by the short time which intervenes between the connection and the re-appearance of the discharge. Gleets are often so exceedingly obstinate, that the surgeon cannot be informed of too many modes and principles of cure. On this account we deem it right to mention that gleets seem to be curable on the principle of counter-irritation. Hunter has seen a gleet stop on the breaking out of two chancre on the glans penis, and the discharge has been known to stop as soon as a blister was applied to the under part of the penis.

Gleets have likewise been cured by electricity.

Women are liable to gleets, and the disease being situated in less irritable parts, whatever injections are used, may be made stronger than for male patients.

It is almost unnecessary to remark, that balsams and turpentine, internally given, can have no specific effect on the parts affected in women, as they have on the urethra in men. Hence it would be absurd to prescribe such medicines for female patients.

GLEIBERG, or GLITZBERG, in *Geography*, a town of Germany, in the principality of Nassau Weilburg; eight miles N.E. of Wetzlar.

GLEICHAN, a county of Germany, in the principality of Gotha, divided between the princes of Gotha, Hohenloe, Hatzfeld, and Schwartzburg, situated on the banks of the Ohr, between Erfurt and Gotha.

GLEICHEN, FREDERIC VON, in *Biography*, was born in the year 1714. He was intended and educated for the profession of arms, and spent the early part of his life as an officer in the service of Bayreuth, and was distinguished by his attention to military discipline. He rose to the rank of lieutenant-colonel, and obtained the favour of the margrave. His honours did not sit easy upon him, he begged for retirement, and in 1756 his wishes were accomplished; he obtained a dismissal from the service with a handsome pension, to which was afterwards added the rank of privy counsellor. He now had leisure to distinguish himself as a philosopher, a naturalist, and a writer. His attention was accidentally excited to microscopical observations, and not satisfied with the instruments already in existence he constructed an universal microscope, with which he combined the solar microscope. His principal observations relate to feminal animalcula, and infusion animals: he would sit day

after day at his glass, and was always displeased if he experienced any interruption while engaged in his favourite pursuit. By daily practice he had acquired uncommon acuteness of sight, which was of the greatest advantage to him in his researches. Though he had an ardent attachment to science for the love of it, yet he devised various economical plans, from which he expected to derive great emolument, but they were the schemes of a theorist, and did not prove of real advantage either to himself or the world. He died in June 1783, leaving behind him numerous works, in natural history, as "Observations on the Parts of Fructification in Plants when in bloom, and on the Infests found in them;" "History of the Common House Fly;" "Treatise on feminal Animalcula and infusion Animals;" "Essay towards the History of the True-love of the Elm;" this insect, the aphid ulmi campestris, cost our author the labour of eight years; it is the cause of the bladders on the leaves of the elm tree during the spring. Ges. Bot.

GLEICHENBERG, in *Geography*, a town of the duchy of Stiria; 10 miles N. of Radlburg.

GLEICHENBERGAN, or GLEICHENBERG, a town of Germany, in the county of Henneberg; four miles N. of Ronfeld.

GLEICHENIA, in *Botany*, named by the writer of this article in honour of Philip Frederick, Baron von Gleichen, author of a splendid microscopical work on the structure and physiology of the parts of fructification in several plants, published at Nuremberg, in folio, with coloured plates, in 1764. As the seeds of ferns were among the subjects to which Baron Gleichen paid great attention, a genus belonging to this curious tribe was judged peculiarly proper to commemorate him. Smith in Mem. de l'Acad. de Turin, v. 5. 419. t. 9. f. 10. Tracts, 258. t. 1. f. 10. Swartz. Fil. 165. Brown. Prod. v. 1. 16c. (Mertensia; Willden. in Act. Holm. ann. 1804. 165. t. 4. 5. Swartz. Fil. 163.)—Class and order, *Cryptogamia Filices*: sect. *Simulate*. Nat. Ord. *Filices dorsiferae*.

Ess. Ch. Capsule, in a simple, concentric, orbicular series; each series constituting a round separate dot, on the back of the leaf. Cover none.

This genus was first founded on the *Osmunda polygalifolia* of Linnæus, an elegant and singular fern, native of the Cape of Good Hope. In this the capsules are usually three, rarely four together, half immersed in the under side of the frond, and as each bursts by a longitudinal fissure, they all together have exactly the appearance of a single capsule, of three cells, and three valves, the partitions seeming to originate from the centre of each valve. Traces of a jointed ring appear on some of the valves only, and rather resemble the corrugations of those ferns termed *sporophylls serrulata*. Several other species, strictly allied to the original one in habit and appearance, so as to be at first slight feared, distinguishable from it, have been found in New Holland, and have been defined by Dr. Swartz and Mr. Brown. In these the capsules are not immersed in the leaf, though each series stands in a slight depression. In *G. maxima* of Brown there are only two together; in others three, four, or even six. These new discovered species evince the propriety of Mr. Brown's measure of reducing the *M. maxima* of Willd now and Swartz to *G. maxima*, as their fructifications exactly agree. *Dimorphium* of Bernhardi does not in our opinion so well assort with them, having an irregular accumulation of stalked capsules in each dot, though its habit is precisely that of *Mertensia*. Mr. Brown, having examined these ferns alive, determines them to be furnished with a complete, striated, transverse, rarely oblique, ring.

This genus naturally divides itself into two sections. The original *Glichenia*, of which there are five species, have the ultimate branches of their repeatedly forked stem pinnate, their leaflets or *pinnae* deeply pinnatifid, with short, triangular, or rounded segments, each segment bearing a single dot or series of capsules. The *Mertensiae* have their ultimate branches deeply pinnatifid, the segments linear, with a row of numerous dots on each side of the midrib of each segment, especially at its lower half. Of these we are acquainted with five or six species, all natives of the East or West Indies, or of New Holland and its neighbourhood.

GLEICHENSTEIN, in *Geography*, a town and castle of Germany, in the territory of Eichsfeld; seven miles S. E. of Heiligenstadt.

GLEINSTOLLEN, a town of the duchy of Stiria; 14 miles S. E. of Voitsberg.

GLEISS, a town of Switzerland, in the Valais; 26 miles E. of Sion.

GLEIWITZ, or GLIWICZ, a town of Silesia, in the principality of Oppeln; 20 miles N. E. of Ratibon. N. lat. 50° 17'. E. long. 18° 35'.

GLEN RIVER, is a river of Lincolnshire, which rises near Ropley, and pursues a course nearly S. S. E. to Bracebrough, when, turning suddenly N. E., it passes to Katesbridge and through the Fens, by Sarfleet, to the sea at Foddyke Wash; for the greater part of its course through the Fens this river is navigable for barges, a circumstance which was overlooked in compiling the alphabetical list of inland navigations in our article CANAL. The small river or drain called the Bourne, which branches from the Glen and proceeds up to Bourne town, is also navigable for some distance upwards. The South Forty-foot navigable drain commences very near to this river, below the mouth of the Bourne, and proceeds by a circuitous route to Boston. See SOUTH FORTY-FOOT.

GLENAA, a mountain in the county of Kerry, Ireland. See KILLARNEY.

GLENAN ISLANDS, a cluster of small islands in the Atlantic, near the coast of France. N. lat. 47° 43'. W. long. 3° 55'.

GLENARM, a post town of the county of Antrim, Ireland, on the east coast of it, adjoining which is Glenarm castle, the seat of the countess of Antrim. The town is pleasantly situated on the sea-shore, near the bay of the same name. It is 104 miles N. from Dublin, and 24 N. from Belfast.

GLENNAVY, a post-town of the county of Antrim, Ireland, situated near the eastern border of Lough Neagh. It is 77 miles N. from Dublin on the road to Antrim.

GLENSCOE, a vale of Scotland, in the county of Argyle, near Loch Leven, where, in the year 1691, the inhabitants were massacred contrary to the faith of a royal proclamation; 17 miles N. of Inverary.

GLENDALOUGH, GLANDELOUGH, or *Glendaloch*, commonly called the *Seven Churches*, an interesting object to travellers in the county of Wicklow, Ireland, 22 miles S. from Dublin, and about seven or eight miles west from Rathdrum. Its name is derived, according to Mr. Ledwich, from its being situated in a valley with lakes, from *glen*, a valley, and *loch*, a lake. That this was the true origin of the name seems to be confirmed by Hoveden, who was chaplain to Henry II., and who calls it equivalently in Latin, *Episcopatus Billagenensis*, the bishopric of the two lakes. Glendalough is surrounded on all sides, except to the east, by stupendous mountains, whose vast perpendicular height throws a gloom on the vale below, well suited to inspire religious dread. From these, many mountain-

streams fall into the valley, and, forming a junction, assume the name of Avonmore. One of these streams, called St. Kevin's keeve, is still an object of superstition; weak and sickly children being dipped in it every Sunday and Thursday before sun-rise, and on the third of June, which is St. Kevin's day. The two lakes in the vale are divided from each other by a rich meadow; the rest of the soil is so rocky as to be incapable of tillage by the plough. The names of the adjoining mountains, in which the word *Derry* often occurs, are supposed to denote that they were formerly covered with wood; at present they have only brown heath, or more sable peat. Between the cathedral and upper lake is a group of thorns of great size; and near the cathedral the trunk of an aged yew, which measures three yards in diameter. From the remains of walls above, and the traces of foundations below the surface of the earth, the town is supposed to have been once pretty large, but the only street appearing is the road leading from the market place into the county of Kildare. It is in good preservation, being paved with stones placed edgewise, and ten feet in breadth. There are seven churches of considerable antiquity, and some chapels which appear to be of later construction. St. Kevin was the patron saint, and his name consequently is given to many of the surrounding objects. He is said to have founded the town or monastery in the sixth century; but Ledwich attributes the erection to the Oslmen, who infested Ireland, in the ninth century. Some figures in a chapel, containing the tomb of St. Kevin, furnish some plausible arguments in support of this opinion. There are two round towers at Glendalough, both of which are adjoining churches, but neither the cathedral nor abbey has such an addition, though if a belfry were the object of these buildings, the preference would probably have been given to them. These towers were also, in Mr. Ledwich's opinion, the work of the Oslmen. The arguments for and against this opinion will be considered under the article ROUND TOWERS. A monastery having been founded here, and the supposed miracles of St. Kevin having been proclaimed, numbers flocked to his shrine; as Girald Cambrensis says, in what had been a barren wilderness, were to be found, after a few years, not only churches and good houses, but much wealth. According to the Irish annals, the town thus founded was often plundered by the piratical freebooters of the north, who, as they subsisted solely by depredations, without reluctance, frequently pillaged their own countrymen. In 1162, Laurence O'Toole, afterwards archbishop of Dublin, was elected abbot; and in a few years after earl Strongbow granted the abbey and parsonage to Thomas, the nephew of Laurence. The charter is one of the most valuable and ancient in Ireland, as it preserves the possessions, privileges, and immunities of the abbey. Previous to this, Glendalough had also had a bishop; but, in 1152, Cardinal Paparon endeavoured to unite it to the see of Dublin. This was refused, and, in 1179, pope Alexander III. confirmed the city to its bishop, saving the rights of the abbot. A letter, written in 1214, is quoted by Ledwich, to shew that Glendalough was at that time become a nest of thieves and robbers. In the reign of king John, the see was united to that of Dublin; but the sect of the O'Tooles, who were very powerful, kept it, in some degree, independent until 1497, when the bishop formally surrendered his right and claim in the Chapter-house of St. Patrick, Dublin. The Seven Churches, when approached by the bridge of Derrybawn, form a very picturesque and pleasing scene. The bridge is thrown over the Avonmore, and is composed of three elliptic arches. Derrybawn, covered to a great extent with an oak coppice on one side, and the huge broccagh on the



other, confines the view up the river to the valley; at the end of which the great round tower, and the other ruins, appear to great advantage. As the new military road has made Glendalough easily accessible, it is frequently visited by travellers. Ledwich's Antiquities.

**GLENE**, ΓΛΗΝΗ, properly signifies the cavity or socket of the eye.

**GLENE** is more frequently used by anatomists for the shallower cavities of bones, into which some other bone is received and articulated.

By which it stands distinguished from *cotyle* or *acetabulum*, which is a deeper cavity, intended by nature for the like purpose.

**GLENEGAD HEAD**, in *Geography*, a cape of Ireland, in the peninsula of Inis Lowen, county of Donegal. W. long. 7° 41' from Greenwich, N. lat. 55° 20'.

**GLENGARRIFF**, a harbour of Ireland, in the county of Cork, on the north-east part of Bantry-bay. The arbutus grows in this neighbourhood in great perfection.

**GLENGARY**, the name of a county in Upper Canada, bounded on the E. by the line which separates Upper from Lower Canada; on the S. by the river St. Lawrence; and on the W. by the township of Cornwall, running N. 24° W., until it intersects the Ottawa or Grand river, thence descending the said river till it meets the fore-mentioned separating line. Glengary county comprehends all the islands contiguous to it in the river St. Lawrence.

**GLENICZA**, a river of the duchy of Warsaw, which runs into the Odra, near Koilen.

**GLENKEN'S CANAL**, is the parliamentary name of an inland navigation, made since the year 1802, in Kirkcudbright county in Scotland. See **CANAL**.

**GLENLUCE**, a town of Scotland, in the county of Wigton, which sprang from an abbey of Cistercians, founded in 1190, called "Vallis Lucis." It is situated at the northern extremity of a large bay to which it gives name; 18 miles W. of Wigton. N. lat. 54° 58'. W. long. 4° 27'. The bay extends on the S. coast of Scotland from the Mull of Galloway to Burrowhead. N. lat. 54° 50'. W. long. 4° 50'.

**GLENMORE**, a small island on the W. coast of Scotland, at the mouth of Loch Stuart. N. lat. 56° 38'.

**GLENOID**, in *Anatomy*, from γληνη, the articular cavity of a bone, and εὐρος, form, a term applied to certain articular surfaces, particularly where the hollow is not deep.

**GLERS**, in *Geography*, a town of Germany, in the county of Tyrol; 21 miles W. of Bolzano.

**GLESE**, a river of Louisiana, which runs into the Mississippi, N. lat. 37° 15'. W. long. 90° 14'.

**GLESUM**, or **GLIJSUM**, in *Natural History*, a name given by many of the ancients to the common yellow amber or succinum. The word seems to have been originally German, and to have been adopted by the Romans in their conquests in that part of the world. They seem to have used the word in general for any transparent substance, and thence to have applied it to amber as a transparent stone. See **GLASS**.

**GLETCHERHORN**, in *Geography*. See **JANNEBRAT**.

**GLIANY**, a town of Poland, in Galicia; 20 miles E. of Lemberg.

**GLIESA**, a town of Sweden, in West Bothnia; 25 miles W. N. W. of Tornea.

**GLIGVI**, a town of Asia, in Dagestan; 90 miles N. of Teilis.

**GLIKEON**, a town of European Turkey, in the province of Epire; 26 miles W. of Arta.

**GLIMS HOLM**, one of the small Orkney islands, which

affords pastures; 2 miles S. of Pomona, between that and Barry.

**GLIMMER**, or **CAT-SILVER**, in *Mineralogy*, according to Dr. Woodward, "Method of Fossils," p. 14, are names for *Mica*, which see. Glim, spangles, daz, and silver, are other names by which the miners and quarrymen designate the shining plates of this substance which they meet with dispersed in the earths and stones in their works. The late Mr. William Martin observes, "Outlines," p. 141, "Glimmer is frequently dispersed through the sand-stones and clay, forming vegetable petrifications, but never constitutes their whole substance." In Derbyshire, it is not uncommon to find nodules, or round nests or masses of mica, in thin and separate plates, in the first, or millstone grit, which fall out on exposure, and leave spherical holes, a circumstance which has, according to Mr. Farey, given rise to rock-basins or holes on the tops of large loose blocks of stone where the water stands in many instances after rain, but not perpetually, as the vulgar opinion is. See **ROCK-BASINS**.

**GLINA**, in *Geography*, a river of Croatia, which runs into the Save; 12 miles W. of Patrinia.

**GLINLOUGH**, a lake of Ireland, in the northern part of the county of Leitrim, from which a small river flows to Sligo bay.

**GLINNINO**, a town of Russia, in the government of Novogorod, on the Misa; 12 miles S. E. of Borovitchi.

**GLINSK**, a town of Russia, in the government of Tchernigof, on the river Sula; 80 miles S. E. of Tchernigof.

**GLINUS**, in *Botany*, derives its name from γληνος or γληνω, a word used by Theophrastus, and denoting a kind of maple, though we cannot trace any similitude between that tree and the little herbaceous plant, to which the name was applied by Loefling; but it was adopted by Linnæus. — Linn. Gen. 243. Schreb. 528. Loefl. Iter. 145. Willd. Sp. Pl. v. 2. 929. Mart. Mill. Dict. v. 2. Lamarck Dict. v. 2. 728. Gærtn. t. 130. Juss. 316. — Class and order, *Dodecandra Pentagynia*. Nat. Ord. *Caryophylli*, Linn. *Trochil.*, Juss.

Gen. Ch. Cal. Perianth inferior, of five ovate, acute, concave leaves, coloured within, permanent, and downy. Cor. none; nectaries about five, resembling narrow petals, shorter than the calyx, and unequally two or three-cleft. Stam. Filaments about fifteen, awl-shaped, flat, as long as the calyx; anthers incumbent, oblong, compressed, two-lobed. *Pist.* Germen of five sides; styles five, short; stigmas simple. *Peric.* Capsule ovate, with five cells, five sides, and five valves. Sides numerous, roundish, in a single row at the base of the valves, tubercled, each attached by a long thread-like stalk.

Ess. Ch. Calyx five-cleft. Corolla none. Nectaries eleven bristles. Capsule five-cornered, five-celled, five-valved, with many seeds.

1. *G. borealis*. Linn. Sp. Pl. 663. Eurm. Ind. 112. t. 36. f. 1. "Stem hairy. Leaves obovate." — Native of Spain, and found by Loefling in a gravelly soil near Telaveira del Badajoz, also in a dried-up rivulet between Merida and Truxillo. Root annual. Stems procumbent, jointed, hairy. Leaves obovate, on foot-stalks. Flowers nearly sessile, crowded together, sometimes on very short hairy stalks. A figure of this species is destined to appear in the *Flora Græca*, t. 472, from a drawing made at Smyrna, and from which it appears that what Gærtner considered as *pub.* are more probably *racem.*, as not being external to the stamens; after all, they ought perhaps to be called

*barren filaments.* They seem, from the dried specimens, to be ranged alternately with the real stamens.

2. *G. dictamnoides.* Willd. Sp. Pl. v. 2. 929. Pluk. Amal. 10. t. 356. f. 6.—“Leaves round, hairy. Stem shrubby, prostrate. Leaflets of the calyx lanceolate.”—Native of India. It seems doubtful whether *G. dictamnoides* be not merely a variety of *lucida*; but as Willdenow still keeps them separate, on the authority of a dried specimen, we have retained the species.

3. *G. fetiflorus.* Willd. Sp. Pl. v. 2. 929. Vahl. Symb. 3. 64.—“Leaves obovate, plaited. Stem shrubby. Leaflets of the calyx ovate.”—Native of inundated woods in Arabia Felix during the rainy season. The whole plant is hoary, from very thick hairs, which are longer than in *G. lucida*. This species was first described by Vahl, from Forskæl's specimen which we have examined. The pubescence is beautifully flattened and very dense.

GLINUS, in *Ichthyology*, a name by which Bellonius and some other authors have called a small sea-fish, more commonly known by the name of the *dracunculus*.

GLIS. In the common acceptation of the word, this only signifies the dormouse: but Linnæus has used *gliris* in a larger sense: and, in his System of Zoology, makes it the name of the fourth order of the mammalia class of animals. The characters of the creatures of this class are, that they have only two fore-teeth in each jaw; they have no *dentes canini*, or dog-teeth; and the feet have toes, and are formed for leaping when they run. The animals of this class are the several species of the *Hyllrix*, *Cavia*, *Castor*, *Mus*, *Arctomys*, *Sciurus*, *Myxus*, *Dipus*, *Lepus*, and *Hyrax*; which see respectively.

GLIS, a name given to several species of *Myxus*; of *Diddelphis*; of *Mus*; and of *Arctomys*; which see respectively.

GLIS Volans. See VESPERTILO *Spafans*.

GLISCHROMICTHES, in *Natural History*, the name of a genus of compound earths. The word is derived from *γλίσσο*, *touch*, and *μικτός*, *mixed*. The bodies of this genus are loams composed of sand and a more acid clay, and are of a tough and firm texture.

The earths of this genus are used in making bricks, and on some other occasions; and are of several distinct species.

GLISSA, in *Ichthyology*, the name of a sea-fish of the tunny kind, but of a perfectly smooth skin, and without free from scales. It usually grows to the length of two cubits, and the thickness of a man's body: it is of a very round body, and has very rough jaws, but no distinct teeth; its tail is forked, but not so arched or hooked as that of the tunny; it lives in deep water, and is a fish of very delicate taste. *Caspar. De Pisc. p. 1158.*

GLISSON, FRANCIS, in *Biography*, was born at Ramptham, in Dorsetshire, in the year 1597, and educated at Cuius college, Cambridge, of which he became a fellow, and in 1627 was incorporated M.A. in Oxford. He then applied himself to the study of physic, in which faculty he took his degree of doctor at Cambridge, and in that university was made regius professor of physic, which office he held about 40 years. He settled in London for the practice of his profession, and was admitted a fellow of the College of Physicians in 1635. In 1639 he was chosen reader of anatomy in the college, and in that department acquired great reputation by his lectures “*De Morbis Partium*,” which he was particularly requested by his colleagues to make public. During the civil wars he retired to Colchester, where he practised with great credit in those times of confusion, and was in the town at its memorable siege by the par-

liamentary forces in 1648. He was one of that small, but illustrious society, who instituted a weekly meeting in London about the year 1645, for the purpose of promoting inquiries into natural and experimental philosophy, which, after having removed to Oxford during the troubles, was augmented in London after the restoration, and became ultimately the Royal Society. He was afterwards several years president of the College of Physicians, and died in 1677, in the parish of St. Bride's, London, aged 80. Glisson left the following works: 1. “*Tractatus de Rachitide, seu morbo puerili Ricketts dicto*,” first published in 1650; it went through several editions abroad, and two translations into English the year after its publication, by Philip Armin, and Nicholas Culpepper. 2. “*Anatome Hepatis, &c.*” London, 1654; afterwards reprinted at Amsterdam and the Hague. This work contains a much more exact description of the liver than had before appeared. The capsule of the *vena portarum* was supposed to be first discovered by him, and has ever since borne his name; but Walæus and Pecquet had found it a short time before, and he has only the merit of having first examined and described it with accuracy. Dr. Glisson's largest work is a metaphysical piece, *viz.* 3. “*Tractatus de Natura Substantiæ Energetica, seu de Vita Naturæ, ejusque tribus primis Facultatibus*,” Lond. 1672, in 4to., a profound and laborious performance, in the very depths of the Aristotelic philosophy, with all its numerous divisions, and an extraordinary effort of the understanding in a man of an advanced age.—4. His last publication, “*Tractatus de Ventriculo et Intestinis, cui præmittitur animæ de partibus continentibus in genere, et in specie, de his Abdominis*,” Lond. 1676, 4to., Amst. 1677, 12mo., contains every thing at that time known concerning the alimentary canal, arranged in a clear manner, with various new observations. In a word, Glisson was exceeded in judgment and accuracy by none of that group of English anatomists, who followed the steps of Harvey with great ardour and success; inasmuch that Boerhaave terms him “*omnium anatomicorum exactissimus*,” and Haller speaks in praise of all his writings. *Aikin Biog. Mem. of Med. Eloy. Dict. Hist.*

GLISTER. See CLYSTER.

GLITNESS, in *Geography*, one of the smaller Shetland islands, on the E. coast of Shetland; 11 miles N. of Lerwick N. lat. 60 22'. W. long. 1 16'.

GLUBEN, a town of European Turkey, in Dalmatia; 18 miles S.E. of Mollar.

GLIZADE, in *Fencing*, is an operation performed by dextrously making your blade slip along that of your adversary by a movement of the wrist, and a quick forward extension of the arm, without deviating from the line of direction. This is a simple, and at the same time a masterly movement in fencing.

GLOBBA, in *Botany*, a Malay name adopted by Rumphius and Linnæus, under which, however, they have included a very heterogeneous assemblage of species. We shall speak only of such as agree in generic character with the original one, seen and described by Linnæus, and preserved in his herbarium. Linn. Mant. 2. 143. Schreb. 25. Willd. Sp. Pl. v. 1. 153. Mart. Mill. Dict. v. 2. Roscoe in Tr. of Linn. Soc. v. 8. 255. t. 20. f. 13. Ait. Hort. Kew. ed. 2. v. 1. 9. Juss. 63. Lamarek Dict. v. 2. 729.—Clas and order, *Melastria Mearnsia*. Nat. Ord. *Scitamineæ*, Linn. *Canna*, Juss.

Gen. Ch. *Cal.* Perianth superior, of one leaf, tubular, permanent; its border three-lobed. *Cor.* of one petal; tube long, cylindrical, slender; outer limb in three, nearly equal, *lobes*, spreading lobes; inner of two similar lobes, and a central,

central, vertical, prominent lip, cloven at each extremity. *Sera* Filament one, prominent, long, linear, channelled, divided at its summit; anther oblong, of two distinct parallel lobes, attached by its back to the dilated part of the filament. *Pist.* Germen inferior, roundish; style thread-shaped, the length of the filament and embraced by it; stigma obtuse. *Peric.* Capsule roundish, of three cells and three valves. *Seeds* numerous.

**Eff. Ch.** Anther in two parts. Filament elongated, incurved, bearing a lobed appendage. Style thread-shaped, embraced by the anther. Corolla with three outer lobes and three inner, the middlemost vertical and cloven.

1. *G. marantina*. Linn Mant. 2. 170 Sm. Exot Bot. v. 2 85 t. 103 (Colebrookia bulbifera; Donn Cant 1)—Appendage of the filament four-lobed, divaricated, terminal. Spike not taller than the leaves. Bractæas elliptical, broad, longer than the calyx—Native of Bengal, from whence it was sent by Dr. Roxburgh to the late lady Amelia Hume in 1800. It flowers in the stove in July and August. *Root* perennial, tuberous. *Stems* several, herbaceous, about two feet high, simple, leafy. *Leaves* elliptical, acute, entire, with one rib and numerous parallel simple veins; smooth above; soft and finely downy beneath; their footstalks long, sheathing, bearded at the top, which is extended upwards into a pair of rounded auricles. *Spike* terminal, solitary, simple, erect, more or less lax, about as tall as the leaves, or rather under that height. *Bractæas* alternate, sessile, elliptical, broad, concave, many-ribbed, somewhat downy, minutely dotted; the lower ones each bearing one ovate bulb; the upper ones a cluster of several flowers, each of which is accompanied by its own smaller bractæa. These flowers are very transient, slender, orange-coloured, with a deeper spot in the centre of the lip.

2. *G. racemosa* Sm Exot. Bot. v. 2. 115 t. 117. (Deofara; of the inhabitants of Nepal)—Appendage of the filament arrow-shaped, narrower than the anther. Cluster elongated, cylindrical. Bractæas shorter than the calyx, deciduous.—Gathered by Dr. F. Buchanan in the woods of Upper Nepal, flowering in June. Habit of the list, but taller, with larger more pointed leaves. The inflorescence is much more striking, and consists of a long terminal racemus of numerous orange-coloured flowers, which are twice the size of the former, and essentially distinguished from that by the arrow-shaped form of the appendage to their filament, which does not extend beyond the anther, except at its rounded termination.

3. *G. variegata*. Sm Exot Bot v. 2. 116 t. 117, a, b, c, (Hura Siamesium; Kœnig in Retz. Obs. fasc. 3. 29)—Appendage of the filament four-lobed, divaricated. Cluster somewhat corymbose. Bractæas shorter than the calyx. Lip towards the middle of the filament—Found by Kœnig plentifully in grassy shady parts of the island called Young Ceylon, in the East Indies. The cluster of flowers is shorter and more corymbose than in *G. racemosa*, and the corolla is variegated with orange, white, and different shades of violet. The appendage of the filament nearly resembles that of *G. marantina*, but the situation of the lip, throat, as it were, half way up the filament, above the other lobes of the corolla, is altogether peculiar. For this, however, we depend on a drawing made by Mr. Sidney Parkinson, and communicated by Sir Joseph Banks, of the accuracy of which we have no reason to doubt. Kœnig mentions a more dwarf variety, found near the town of Malacca. Can this be what has lately been introduced into the stoves about London by Dr. Roxburgh, and which we have seen and examined at Sir Abraham Hume's, and at Messrs. Lee and Kennedy's, flowering in June 1810? It is figured in Curtis's Magazine,

t. 1320, where Dr. Sims has, we think, justly made the pretty plant a new genus, by the name of *Jantzia salutaris*. It differs from *Globba* in having a radical, not terminal, inflorescence, which, as far as we know, is an infallible indication of a generic difference in this natural order, and therefore the flower affords, as was necessarily to be expected, clear essential characters of distinction, in the two long linear appendages to the lower part of the filament, which supply the place of two of the inner segments of the corolla, while the lip, which makes the third, is not built at its upper extremity. The large purple bractæas, and the branched flower-stalk, are also remarkable. S.

**GLOBE**, in *Cosmology*, a round or spherical body, more usually called a *sphere*; which see.

The earth and water together are supposed to form a globe; hence called the *terraquous globe*.

The planets, both primary and secondary, are supposed, as well as our earth, to be solid globes.

The earth is, in a particular sense, called the globe, or globe of earth; though it is now well known that this is not its true figure. See *Figure of the Earth*.

**GLOBE**, *Resistance of a*. See **RESISTANCE**.

**GLOBE** is more particularly used for an artificial sphere of metal, plaster, paper, or some other matter; on whose convex surface is drawn a map, or representation, either of the earth or heavens, with the several circles conceived thereon.

Globes are of two kinds, *terrestrial* and *celestial*; each of very considerable use, the one in astronomy, and the other in geography, to perform many of the operations thereof in an easy, sensible manner, so as to be conceived without any knowledge of the mathematical grounds of those arts.

The fundamental parts, common to both globes, are an axis, representing that of the world, and a spherical shell or cover, which makes the body of the globe, on whose external surface the representation is drawn.

Globes, we have observed, are made of divers materials, viz. silver, brass, paper, plaster, &c. Those commonly used are of plaster and paper; the construction whereof is as follows.

**GLOBES, Construction of.** A wooden axis is provided, somewhat less than the intended diameter of the globe; and into the extremes hereof two iron wires are driven for poles; this axis is to be the beam or basis of the whole structure.

On the axis are applied two spherical, or rather hemispherical caps, formed on a kind of wooden mould or block. These caps consist of past board and paper, laid, one by after another, on the mould, to the thickness of a crepe piece; after which, having stood to dry and embay, making an incision along the middle, the two caps thus parted, are slipped off the mould.

They remain now to be applied on the poles of the axis, as before they were on those of the mould; and to fix them in their new place, the two edges are sewn together with packthread, &c.

The rudiments of the globe thus laid, they proceed to strengthen and make it smooth and regular. In order to this, the two poles are held in a metallic hemisphere of the size intended; and a kind of plaster, made of whiting, water, and glue, heated, melted, and incorporated together, is daubed all over the upper surface. In proportion the plaster is applied, the ball is turned round in the hand, the edge where it parts off what was its circumference, and beyond the due dimension, leaving the rest adhering in places that are inert of it.

After such application of plaster, the ball stands to dry; which done, it is put again in the hemisphere, and fresh matter

matter applied: thus they continue alternately to apply the composition, and dry it, till such time as the ball everywhere accurately touches the semi-circle; in which state it is perfectly smooth, regular, firm. &c.

The ball thus finished, it remains to paste the map or description thereon: in order to this, the map is projected in several gores or gullets, all which join accurately on the spherical surface, and together cover the whole ball. To direct the application of these gores, lines are drawn by a semi-circle on the surface of the ball, dividing it into a number of equal parts corresponding to those of the gores, and subdividing those again answerably to the lines and divisions of the gores.

The papers thus pasted on, there remains nothing but to colour and illuminate the globe, and to varnish it, the better to resist dust, moisture, &c.

The globe itself thus finished, they hang it in a brass meridian, with an hour circle and quadrant of altitude, and thus fit it into a wooden horizon.

**GLOBES, Description of the.** The things common to both globes are either delineated on the surface, or added as appendages without it.

Without the surface are, 1. The two poles whereon the globe is turned, representing those of the world. (See **POLE**.) 2. The brazen meridian, which is divided into degrees, and passes through the poles. 3. The wooden horizon, whose upper side represents the horizon, and is divided into several circles; the innermost whereof contains the twelve signs of the zodiac, subdivided into their degrees; the next the Julian; and the third the Gregorian calendar; without side of all these, are drawn the points of the winds. 4. A brass quadrant of altitude, divided into 90 degrees, to be fastened on the meridian at the distance of 90 degrees from the horizon. 5. The hour-circles, divided into twice twelve hours, and fitted on the meridian, round the poles, which carry an index pointing to the hour. A mariner's compass is sometimes added on the bottom of the frame, and sometimes a semi-circle of position.

On the surface are delineated, 1. The equinoctial line, divided into 360 degrees, commencing from the vernal interfections. 2. The ecliptic, divided into twelve signs, and these subdivided into degrees. 3. The zodiac. 4. The two tropics. And, 5. The polar circles. All which see under their proper articles.

What else belongs to globes, either as to construction or description, is different as the globe is either *celestial* or *terrestrial*.

Our common globes, though instructive instruments for explaining the first rudiments of geography and the spherical doctrine of astronomy, yet labour under several defects; as they do not shew how the phenomena, illustrated by them, arise from the motion of the earth, which is the principal thing beginners especially should have in view, and as they are only formed for the present age, and do not serve the purposes of chronology and history, which they might be made to do, if the poles, whereon they turn, were contrived to move in a circle round those of the ecliptic, according to its present obliquity.

Mr. John Senex, F R S. invented a contrivance for remedying these defects, by fixing the pole of the diurnal motion to two shoulders or arms of brass, at the distance of  $23^{\circ} 27'$  from the poles of the ecliptic. These shoulders are strongly fastened at the other end to an iron axis, which passes through the poles of the ecliptic, and is made to move round with a very stiff motion; so that when it is adjusted to any point of the ecliptic, which the equator is made to intersect, the diurnal motion of the globe on its axis will not be able to

disturb it. When it is to be adjusted for any time, past or future, one of the brazen shoulders is brought under the meridian, and held fast to it with one hand, whilst the globe is turned about with the other, so that the point of the ecliptic, which the equator is to intersect, may pass under 0 degree of the brazen meridian: then holding a pencil to that point, and turning the globe about, it will describe the equator according to its position at the time required; and transferring the pencil to  $23^{\circ} 27'$ , and  $66^{\circ} 33'$  on the brazen meridian, the tropics and polar circles will be so described for the same time. By this contrivance, the celestial globe may be so adjusted, as to exhibit not only the risings and settings of the stars, in all ages and in all latitudes, but likewise the other phenomena that depend upon the motion of the diurnal axis round the annual axis. Senex's celestial globes, especially the two greatest, of seventeen and twenty-eight inches in diameter, have been constructed on this principle: so that by means of a nut and screw, the pole of the equator is made to revolve about the pole of the ecliptic. Phil. Trans. N<sup>o</sup> 447, p. 201. 203. or Martyn's Abr. vol. viii. p. 217. and N<sup>o</sup> 493, art. 18 in Phil. Trans. vol. xli. p. 290.

Mr. Joseph Harris, late assay-master of the mint, contrived to remedy the former of the defects above-mentioned, by placing two horary circles under the meridian, one at each pole; these circles are fixed tight between two brass collars placed about the axis, so that when the globe is turned, they are carried round with it, the meridian serving as an index to cut the horary divisions. The globe, in this state, serves readily for solving problems in north and south latitudes, and also in places near the equator; whereas, in the common construction, the axis and horary circle prevent the brass meridian from being moveable quite round in the horizon. This globe is also adapted for shewing how the vicissitudes of day and night, and the alteration of their lengths, are really occasioned by the motion of the earth; for this purpose, he divides the brass meridian, at one of the poles, into months and days, according to the sun's declination, reckoning from the pole. Therefore, by bringing the day of the month to the horizon, and rectifying the globe according to the time of the day, the horizon will represent the circle separating light and darkness, and the upper half of the globe the illuminated hemisphere, the sun being in the zenith.

Mr. Harris also gives an account of a cheap machine for shewing how the annual motion of the earth in its orbit causes the change of the sun's declination, without the great expence of an orrery. Phil. Trans. N<sup>o</sup> 456, p. 321, &c. or Martyn's Abr. vol. viii. p. 352.

The late Mr. George Adams, mathematical instrument maker to his majesty, has made some useful improvements in the construction of the globes. His globes, like others, are suspended at their poles in a strong brass circle, and turn therein upon two iron pins, which are the axis. They have besides a thin brass semi-circle, moveable about the poles, with a small, thin, sliding circle upon it. On the terrestrial globe, the thin brass semi-circle is a moveable meridian, and its small sliding circle the visible horizon of any particular place to which it is set. On the celestial globe, the semi-circle is a moveable circle of declination, and its small annexed circle an artificial sun or planet. Each globe hath a brass wire circle, placed at the limits of the twilight, which, together with the globe, is set in a wooden frame, supported by a neat pillar and claw, with a magnetic needle at its base. On the terrestrial globe the division of the earth into land and water is laid down from the latest discoveries; there are also many additional circles, as well as the rhumb-lines, for solving all the necessary geographical and nautical

nautical problems. On the celestial globe, all the southern constellations, lately observed at the Cape of Good Hope by M. de la Caille, and all the stars in Mr. Flamsteed's British Catalogue, are accurately laid down and marked with Greek and Roman letters of reference, in imitation of Bayer. Upon each side of the ecliptic are drawn eight parallel circles, at the distance of one degree from each other, including the zodiac; and these are crossed at right angles with segments of great circles at every fifth degree of the ecliptic, for the more readily noting the place of the moon, or of any planet upon the globe. The author has also inserted, from Ugh Beigh, printed at Oxford in 1665, the mansions of the Moon of the Arabian Astronomers, so called, because they observed the moon to be in or near one of these every night during her monthly course round the earth, to each of which the Arabian characters are fixed. On the strong brass circle of the terrestrial globe, and about  $23\frac{1}{2}$  on each side of the north pole, the days of each month are laid down according to the sun's declination; and this brass circle is so contrived, that the globe may be placed with the north and south poles in the plane of the horizon, and with the south pole elevated above it. The equator, on the surface of either globe, serves the purpose of the horary circle, by means of a semi-circular wire placed in the plane of the equator, carrying two indices, one of which is occasionally to be used to point out the time. For a farther account of these globes, with the method of using them, the reader may consult Adams's Treatise on their Construction and Use, &c. 1769.

**GLOBE, Celestial**, is an artificial sphere, on whose convex surface the fixed stars are laid down, at proportionable distances, together with the principal circles of the sphere.

The surface of the celestial globe may be esteemed a just representation of the concave expanse of the heavens, notwithstanding its convexity; for if the eye were placed in the centre of it, and the globe made of glass, the stars that are drawn upon it would appear in a concave surface, exactly corresponding to those in the heavens. The use of these globes is to exhibit the phenomena of the motions of the sun and stars, in an easy and obvious manner; which, though somewhat inaccurate, is yet exact enough for the common uses of life, and may save the trouble of trigonometrical calculations.

*To exhibit the stars, circles, &c. on the surface of a given sphere or ball, and fit for the uses of astronomy.*—1. Assume any two points diametrically opposite to each other, as P and Q (*Plate XIV. Astronomy, fig. 117.*) and in these fix up axes, P A and Q C, for the ball to turn round on. The points P and Q, or A and C, will exhibit the poles of the world.

2. Divide a brazen circle A B C D into four quadrants, A E, E C, C F, and F D; and subdivide each quadrant into 90 degrees, numbered from the points E and F, towards the poles A and C.

3. Incline the globe in this circle, as in a meridian, at the points A and C, so as it may freely turn therein.

4. Apply a style or pin to the surface of the globe, in the first degree of the meridian, and turn the ball round; by this means will a circle be described on the surface, representing the equator to be divided into degrees.

5. From the pole of the world P towards M, and from the other pole C towards N, number  $23\frac{1}{2}$  degrees; the points M and N will be the poles of the ecliptic.

6. Apply a style to the meridian, in the point M, and turn the globe round; by this rotation will the arctic polar

circle be described: and after the same manner is the antarctic polar to be described about the point N.

7. Number  $23\frac{1}{2}$  deg. from the equator towards the poles P and Q, and note the points H and I; then applying a style to the meridian, as before, two circles will be described parallel to the equator, whereof that drawn through H will be the tropic of Cancer, and the other through I the tropic of Capricorn.

8. Hang the globe within the meridian, in the poles of the ecliptic, as before in the poles of the world; and applying a style to E, turn it round: by this means will the ecliptic be delineated, which remains to be divided into twelve signs; and each of these, again, divided into thirty degrees.

9. While the globe remains thus suspended, bring the degree of longitude of any star under the meridian; and in the meridian, number as many degrees towards the pole as is the degree of latitude of the place: the point of intersection is the place of that star on the surface of the globe. After the like manner may the place of the star be determined from the right ascension and declination given, the globe being supposed suspended from the poles of the world, or the equator.

10. All the stars of a constellation thus laid down, the figure of the constellation is to be designed; after which it may either be coloured or engraven.

11. Place the globe with the meridian, in a wooden frame or horizon, D B L, supported on four feet, in such manner as to be divided thereby into two hemispheres, and that the pole A may be raised or depressed at pleasure.

12. On the limb or edge of the horizon describe a circle, which divide into 360 degrees, and insert the calendars and winds.

13. Lastly, To the pole A fit a brazen circle, divided into twenty-four horary parts, and numbered twice twelve, so that the line of division of XII. may be in the plane of the meridian, on either side the pole; and on the pole itself apply an index, to turn round with the globe. See *Horary CIRCLE*. Thus is the globe complete.

It may be here observed, that as the longitude of the stars is continually increasing, a common globe does not remain of perpetual use: but the increase in seventy-two years only amounting to a degree, the whole will make no considerable error in a hundred years; the design of a globe being only to represent things something near the truth.

**GLOBE, to make a celestial.** This method is that the most frequently used; and we only premised the former as being the most easily conceived, and leading more naturally to this.

1. From the given diameter of the globe, find a right line A B, *fig. 118.* equal to the circumference of a great circle, and divide it into twelve equal parts.

2. Through the several points of division, 1, 2, 3, 4, &c. with the interval of ten of them, describe arches, mutually intersecting each other in D and E: these figures or pieces, duly pasted or joined together, will make the whole surface of the globe.

3. Divide each part of the right line A B into thirty equal parts, so that the whole line A B, representing the periphery of the equator, may be divided into 360 degrees.

4. From the poles D and E, *fig. 119.* with the interval of  $23\frac{1}{2}$  deg. describe arches a, b; these will be twelve parts of the polar circles.

5. After the like manner, from the same poles D and E, with the interval of  $66\frac{1}{2}$  deg. reckoned from the equator, describe

describe arches  $c, d$ ; these will be twelfth parts of the tropic.

6. Through the degree of the equator  $e$ , corresponding to the right ascension of any given star, and the poles  $D$  and  $E$ , draw an arch of the circle, and taking in the compasses the complement of the declination from the pole  $D$ , describe an arch intersecting it in  $i$ ; this point  $i$  will be the place of that star.

7. All the stars of a constellation being thus laid down, the figure of the constellation is to be drawn according to Bayer, Hevelius, or Flamsteed.

8. Lastly, after the same manner are the declinations and right ascensions of each degree of the ecliptic  $d g$  to be determined.

9. The surface of the globe thus projected on a plane is to be engraven on copper, to save the trouble of doing this over again for each globe.

10. A ball, in the mean time, is to be prepared of paper, plaster, &c. after the manner above directed, and of the intended diameter of the globe: on this, by means of a semi-circle and style, is the equator to be drawn: and through every 30th degree a meridian. The ball thus divided into twelve parts, corresponding to the segments before projected, they are to be cut from the printed paper, and pasted on the ball.

11. Nothing now remains but to hang the globe, as before, in a brazen meridian and wooden horizon; to which may be added a quadrant of altitude  $H I$ , *fig. 120.* made of brass, and divided in the same manner as the ecliptic and equator.

If the declinations and right ascensions of the stars be not given, but their longitudes and latitudes in lieu thereof, the surface of the globe is to be projected after the same manner as before: except that, in this case,  $D$  and  $E$ , *fig. 121.* are the poles of the ecliptic, and  $f h$  the ecliptic itself; and that the polar circles and tropics, with the equator  $g d$ , and the parallels thereof, are to be determined from their declinations.

One of the fullest catalogues of the stars is that of Mr. Flamsteed; wherein the right ascensions and declinations, as well as the longitudes, latitudes, &c. are every where expressed.

**GLOBE, use of the celestial.** The use of this instrument is very extensive; there being scarcely any thing in the spherical astronomy but may be exhibited thereby.

The principal points are contained in the following problems, with their solution; which will let the reader enough into the nature and reason of this noble instrument, to apply it, of his own accord, in any other cases.

*To find the right ascension and declination of a star, represented on the surface of the globe.*—Bring the star to the graduated side of the brazen meridian; then the number of degrees intercepted between the equator, and the point on the meridian cut by the star, gives its declination; and the degree of the equator which comes under the meridian, together with the star, is its right ascension.

*To find the longitude and latitude of a star.*—Apply the centre of the quadrant of altitude over the pole of the ecliptic in the same hemisphere with the star, and bring its graduated edge to the star: the degree on the quadrant cut by the star is its latitude, reckoned from the ecliptic; and the degree of the ecliptic cut by the quadrant its longitude.

*To find the sun's place in the ecliptic.*—Seek the day of the month in the proper calendar on the horizon, and against the day in the circle of signs is the sign and degree the sun is in for that day; this done, find the same sign upon the

ecliptic, on the surface of the globe; this is the sun's place for that day.

*To find the declination of the sun.*—The sun's place for the day given being brought to the meridian, the degrees of the meridian intercepted between the equinoctial and that place, are the sun's declination for that day at noon.

*To find the place of a planet, with its right ascension and declination; its longitude and latitude for the time being given.*—Apply the centre of the quadrant of altitude on the pole of the ecliptic (the pole, we mean, of the same denomination with the latitude), and bring it to the given longitude in the ecliptic: this point is the planet's place; and bringing it to the meridian, its right ascension and declination will be found, as already shewn of a star.

*To rectify the globe, or adjust it to the place, &c. so as it may represent the present state or situation of the heavens.*—

1. If the place be in north latitude, raise the north pole above the horizon; if in south, raise the south pole; till the arch intercepted between the pole and horizon be equal to the given elevation of the pole. 2. Fix the quadrant of altitude on the zenith, *i. e.* on the latitude of the place. 3. By means of a compass or meridian line, place the globe in such a manner as that the brazen meridian may be in the plane of the terrestrial meridian. 4. Bring the degree of the ecliptic the sun is in to the meridian, and set the horary index to twelve; thus will the globe exhibit the face of the heavens for the noon of that day. 5. Turn the globe till the index come to any other given hour: thus will it shew the face of the heavens for that time.

*To know all the stars and planets by means of the globe.*—

1. Adjust the globe to the state of the heavens for that time. 2. Look on the globe for some one star which you know, *e. gr.* the middlemost star in the tail of the Great Bear. 3. Observe the positions of the other more conspicuous stars in the same constellation; and by transferring the eye from the globe to the heavens, you will easily note the same there. 4. After the same manner may you proceed from this to the neighbouring constellations, till you have learned them all.

If the planets be represented on the globe, after the manner above described, by comparing them with the neighbouring stars you will likewise know the planets.

*To find the sun's oblique ascension, his eastern amplitude, and azimuth, with the time of rising.*—1. Rectify the globe for the hour of twelve, and bring the sun's place to the eastern side of the horizon: then the number of degrees, intercepted between that degree of the equator now come to the horizon and the beginning of Aries, is the sun's oblique ascension. 2. The degrees on the horizon, intercepted between the east point thereof and the point wherein the sun is, is the ortive or rising amplitude. 3. The hour, pointed to by the index, is the time of the sun's rising. 4. Turning the globe till the index points to the present hour, lay the quadrant to the sun's place: the degree cut by the quadrant, in the horizon, is the sun's azimuth.

*To find the sun's oblique descension, western amplitude, and azimuth, with the time of setting.*—The solution of this problem is the same as that of the former; excepting that the sun's place must be here brought to the western side of the horizon, as in the former it was to the eastern.

*To find the length of day and night.*—1. Find the time of the sun's rising, which being numbered from midnight, the double thereof gives the length of the night. 2. Subtract the length of the night from the whole day, or twenty-



twenty-four hours, and the remainder is the length of the day.

*To find the rising, setting and culminating of a star; its continuance above the horizon for any place and day; together with its oblique ascension and descension, and its eastern and western amplitude and azimuth.*—1. Adjust the globe to the state of the heavens at twelve o'clock that day. 2. Bring the star to the eastern side of the horizon: thus will the western amplitude and azimuth, and time of rising, be found, as already taught of the sun. 3. Bring the same star to the western side of the horizon: thus will the western amplitude and azimuth, and the time of setting, be found. 4. The time of rising, subtracted from that of setting, leaves the continuance of the star above the horizon. 5. This continuance above the horizon, subtracted from twenty-four hours, leaves the time of its continuance below the horizon. 6. Lastly, the hour to which the index points, when the star is brought to the meridian, gives the time of its culmination.

*To find the altitude of the sun, or star, for any given hour of the day or night.*—1. Adjust the globe to the position of the heavens, and turn it till the index point at the given hour. 2. Fix on the quadrant of altitude, at 90 degrees from the horizon, and bring it to the sun's or star's place; the degrees of the quadrant, intercepted between the horizon and the sun or star, is the altitude required.

*The altitude of the sun by day, or of a star by night, being given, to find the time of that day or night.*—1. Rectify the globe as in the preceding problem. 2. Turn the globe and quadrant, till such time as the star, or degree of the ecliptic the sun is in, cut the quadrant in the given degree of altitude; then does the index point at the hour sought.

*The azimuth of the sun or a star given, to find the time of the day or night.*—Rectify the globe, and bring the quadrant to the given azimuth in the horizon; turn the globe, till the star come to the same: then will the index shew the time.

*To find the interval of time between the risings of two stars, or the culminations.*—1. Raise the pole of the globe so many degrees above the horizon, as is the elevation of the pole of the place. 2. Bring the first star to the horizon, and observe the time the index points to. 3. The same do by the other star: then subtracting the former time from the latter, the remainder is the interval between the risings.

After the like manner is the interval between two culminations found, by bringing both stars to the meridian.

*The day of the month being given, to find when any star will come to the meridian.*—Rectify for the sun's place; turn the globe till the given star comes to the meridian; then the index will point to the time sought.

*To find when any given star will come to the meridian, at any given hour of the night.*—Bring the given star to the meridian; set the index to twelve at noon; then turn the globe eastward, till the index points to an hour as far distant in the forenoon from twelve as the given hour is in the afternoon, observe the degree of the ecliptic then at the meridian, over-against which degree, in the calendar, is the day of the month, when the given star will be upon the meridian at the given hour.

*By observation of a star upon the meridian, to find the hour of the night.*—Rectify for the latitude and the sun's place; bring the given star to the meridian, and the index will shew the hour of the night.

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*To find the beginning and ending of the crepusculum or twilight.*—1. Rectify the globe, and set the index to the twelfth hour, the sun's place being in the meridian. 2. Note the sun's place, and turn the globe westward, as also the quadrant of altitude, till the point opposite the sun's place cut the quadrant of altitude in the eighteenth degree above the horizon: the index will then shew the time when the twilight commences in the morning. 3. Taking the point opposite to the sun, bring it to the eastern hemisphere, and turn it, till it meet with the quadrant of altitude in the eighteenth degree: then will the index shew the time when the twilight ends.

*Given the sun's longitude and the obliquity of the ecliptic, to find the sun's right ascension and declination.*—Find the sun's longitude or place on the ecliptic, and bring it to the brazen meridian. Then the arc of the equator, between the first point of Aries and the brazen meridian, shews the sun's right ascension; and the arc of the brazen meridian between the equator and the ecliptic shews the declination.

*Given the obliquity of the ecliptic and the sun's declination, to find the sun's longitude and right ascension.*—Mark the sun's declination on the brazen meridian, and turn the globe till the ecliptic comes under the figure; then will the distance from the meridian to the first point of Aries shew the sun's longitude on the ecliptic, and its right ascension on the equator.

*Given the obliquity of the ecliptic and the sun's right ascension, required the sun's declination and longitude.*—Bring the sun's right ascension in the equator to the brazen meridian, then will the intercepted arc of the ecliptic to Aries shew the sun's longitude; and the arc of the meridian, that is between the sun's right ascension and longitude, will shew the declination.

*To find on what day the sun begins to shine constantly at any given place in either of the frigid zones, and how long he continues to shine without intermission at the same place.*—Subtract the latitude of the given place from 90, and find in what two days of the year the sun's declination is exactly equal to the remainder, and of the same kind as the latitude of the place; then on the first of those days in the spring quarter, the sun ceases to set at the given place, and shines without intermission there till he arrives at another point of the ecliptic, as many degrees on the other side of the summer solstice, when his declination is again equal to the complement of the latitude: the space of time between those two days is the length or duration of the longest day.

*To find the latitude of those places in the north frigid zone, where the sun begins to shine constantly on any day between the vernal equinox and the summer solstice, or in the south frigid zone on any day between the autumnal equinox and the winter solstice.*—Find the sun's declination for the given day; subtract it from 90, and the remainder will be the latitude of those places: where the sun begins to shine constantly the latitude is of the same kind as the sun's declination.

*To determine under what latitude two given stars rise or set at the same instant.*—Bring one of the stars to the horizon, and, keeping it there, raise or depress the pole till the other is on the horizon at the same time, observing whether this is effected on the east or west position of the horizon; then the degree of the meridian, intercepted by the horizon, will be the latitude of the place required.

*To find at what place a given star is vertical at any given hour at London; e. g. at what place will Capella be vertical the 21 of March at 10 o'clock afternoon, at London time.*

*N. B.*—This problem requires the assistance of both the terrestrial and celestial globes.

1. Find, as above, the time of the meridian passage of the star:

star: in the present instance Capella passes about 6 o'clock in the afternoon.

2. Find under what meridian they reckon 6 o'clock when it is so with us, which will be four hours to the west.

3. Observe under this meridian the place whose latitude is equal to the declination of the star, which, in this example, is nearly 46: and this place, which is near Louiburg, in North America, will be the place required.

*To explain the phenomena of the hare & moon by the globe, see Moon.*

**GLOBE, Terrestrial,** is an artificial sphere, on whose surface are delineated the principal places of the earth, in their proper situations, distances, &c. together with their circles imagined on the surface of the terrestrial sphere. The use of the terrestrial globe, is to exhibit the several affections and phenomena of the different places of the earth, depending on magnitude, &c. in an easy obvious manner, without the trouble of trigonometrical calculations.

**GLOBE, To construct a terrestrial.**—The construction of a terrestrial globe, whether of metal, plaster, paper, &c. is the same as that of a celestial. The same circles are delineated on both: and as for the places, *viz.* cities, towns, &c. they are laid down from the longitudes and latitudes given, as the stars are from their right ascensions and declinations.

Hence all problems, depending on the circles, may be equally wrought on either globe; as the ascensions, descensions, amplitudes, azimuths, risings, settings, altitudes, &c. of the sun; the lengths of day and night; hours of the day and night; crepuscula, &c.

We shall here, therefore, only give what is peculiar to the terrestrial globe.

**GLOBE, Use of the terrestrial. To find the longitude and latitude of any place delineated on the globe.**—Bring the place to the graduated side of the Earth's meridian: the degree of the meridian it cuts is the latitude required; and the degree of the equator, at the same time under the meridian, is the longitude required.

*The longitude and latitude given, to find the place on the globe.*—Seek, in the equator, the given degree of longitude, and bring it to the meridian; then count from the equator on the meridian the degrees of latitude given, towards this or that pole, as the latitude is either north or south: the point under this is the place required.

*The hour being given at any place, to find what hour it is in any other part of the world.*—Bring the given place to the meridian, and set the hour-index to the given hour; then, by turning the globe, bring any place to the meridian, and the index will point to the hour of that place.

*To find the anteci, periaci, and antipodes of any place.*—1. The given place being brought to the meridian, count as many degrees on the meridian from the equator towards the other pole: the point which is thus arrived at is the place of the anteci. 2. Note the degree of the meridian over the given place and its anteci, and turn the globe till the opposite degree of the equator come under the meridian; or, which amounts to the same, till the index, which before stood at twelve, come to the other twelve: then will the place, corresponding to the former degree, be the periaci; and the latter, that of the antipodes.

*To find what place of the earth the sun is vertical to at any time assign'd.*—1. Bring the sun's place found in the ecliptic to the meridian, and the index to the hour of twelve, noting what point of the meridian corresponds thereto. 2. If the given hour be before noon, subtract it from twelve hours, and turn the globe towards the west, till the index points at

the hours remaining: thus will the place required be under the point of the meridian before noted. 3. If the hour be after noon, turn the globe in the same manner towards the west, till the index points at the given hour: thus, again, will the place required be found under the point of the meridian before noted.

If, at the same time, you note all the places which are under the same half of the meridian with the place found, you will have all the places to which the sun is then in the meridian; and the opposite half of the meridian will shew all the places in which it is then mid-night.

*A place being given in the torrid zone, to find the two days in the year wherein the sun is vertical in the same.*—1. Bring the given place to the meridian, and note the degree of the meridian corresponding thereto. 2. Turn the globe about, and note the two points of the ecliptic passing through that degree. 3. Find on what days the sun is in these points of the ecliptic: for on those days he is vertical to the given place.

*To find those places in the torrid zone to which the sun is vertical on a given day.*—Bring the sun's place in the ecliptic to the meridian; then turning the globe round, note all the places which pass through that point of the meridian: those are the places required.

After the same manner may be found what people are asen for any given day.

*The day and hour at any place being given, to find where the sun is vertical at that hour.*—Bring the sun's place to the meridian, and the degree over it is the sun's declination at that time: then bring the given place to the meridian, and set the index to the given hour: turn the globe till the index points to twelve at noon, and the place on the globe which lies under the degree of the sun's declination has the sun then vertical.

*A place being given in the frigid zone, to find the time when the sun begins to appear above the horizon, and when it begins to disappear: and also the length of the longest day or night in that place.*—Rectify for the latitude: bring the ascending part of the ecliptic, *v. z.* for latitudes north of the tropic of Cancer the semicircle intercepted between Capricorn and Cancer, to the fourth point of the horizon: observe the degree of the ecliptic which cuts that point, and find when the sun enters that degree, and this will give the time when the sun begins to appear in that latitude. Bring the descending part of the ecliptic to the same point of the horizon, and the calendar will shew when the sun leaves that latitude and disappears. Again, bring the ascending part of the ecliptic to the north point of the horizon, and the degree, as before, will shew in the calendar when the longest day begins; and by bringing the descending part of the ecliptic to the same north point, we shall find, in the same manner, when the longest day ends.

*To find the latitude of the places wherein any given day is of any given length.*—1. Bring the sun's place for the given day to the ecliptic, and set the index to the hour of twelve. 2. Turn the globe, till the index points at the hour of rising or setting. 3. Raise and depress the pole till the sun's place appear in the eastern and western side of the horizon: then will the pole be duly elevated, and, consequently, the latitude given.

*To find the latitude of those places in the frigid zone where the sun does not set for a given number of days.*—1. Count so many degrees from the next tropic, towards the equinoctial point, as there are units in half the number of the given days; because the sun, in its proper motion, goes nearly a degree every day. 2. Bring the point of the ecliptic, thus found, to the meridian; and its distance from the pole will

will be equal to the elevation of the pole, or latitude of the places required.

*Any hour of the day or night being given, to shew all those places to which the sun rises and sets; where it is noon or midnight; and where day or night.*—1. Find what place the sun is at that time vertical to, as already taught. 2. Let this place be brought to the zenith of the wooden horizon, *i. e.* elevate the pole as the latitude of that place requires; then will the places on the eastern side of the horizon be those the sun is setting to; and on the western side, those he rises to: those under the upper semi-circle of the meridian have it noon; and those under the lower, midnight. Lastly, to those of the upper hemisphere it is day; and to those in the lower, night.

Hence, as in the middle of an eclipse, the moon is in that degree of the ecliptic opposite to the sun's place; by the present problem it may be shewn what places of the earth then see the middle of the eclipse, and what the beginning or ending.

*To find what places of the earth a planet, e. gr. the moon, is vertical to any day of the year.*—1. Mark the planet's place on the globe, as above taught. 2. Bring this place to the meridian, and note the degree over it. 3. Turn the globe round, and the places which pass under the point are those required.

*The declination of a star, or any other phenomenon, given, to find what parts of the earth the same is vertical to.*—Count as many degrees in the meridian, from the equator towards one pole, as are equal to the given declination; *viz.* towards the north, if the declination be to the northward; and towards the south, if the declination be south. Then turning it round, the places that pass through the extremity of this arch in the meridian are the places required.

*To determine the place of the earth where any star, or other celestial phenomenon, will be vertical at a given hour.*—1. Elevate the pole according to the latitude of the place, from whose noon or midnight the hours are numbered. 2. Bring the sun's place for that day to the meridian, and set the index at twelve o'clock. 3. Determine the place of the star on the surface of the globe, and bring it to the meridian; the index will shew the difference of time between the impulse of the sun and star to the meridian of the place: note the point of the meridian over the place of the star. 4. Find in what places of the earth it is then noon, and set the index to twelve o'clock. 5. Turn the globe towards the west, till the index has passed over the interval of time between the culmination of the sun and star. Then, under the point of the meridian, before observed, will the place required be found. And hence may always be found what place a star, or other phenomenon, rises or sets to at any given time.

*To place the globe in such manner, under any given latitude, as that the sun shall illuminate all those regions which he actually illumines on earth.*—1. Rectify the globe, *i. e.* elevate the pole according to the latitude of the place; bring the place to the meridian, and set the globe north and south by the compasses; thus, the globe having the same situation with regard to the sun as the earth has, that part thereof will be illuminated which is illuminated on earth. Hence also the globe being situate in the same manner, when the moon shines, it will shew what parts are then illuminated by the moon.

And in the like manner, we may find when the sun and moon rise and set at any given time.

*To find the distance of two places on the globe.*—Take the given places in the compasses, and apply them to the equa-

tor: the degrees which there subtend being reduced into miles, leagues, or the like, give the distances required.

The same may be done, and that more commodiously, by laying the graduated edge of the quadrant of altitude over the two places, and noting the degree intercepted.

*To find how any one place bears from another.*—Bring one place to the meridian, and lay the quadrant of altitude over the other, and it will shew on the horizon the point of the compass on which the latter bears from the former.

Problems on the terrestrial globe may sometimes be advantageously solved, by considering the horizon as the circle of illumination, and bringing the sun's place to the zenith.

*To find for any given day and hour those places where the sun is then rising or setting; those places where it is noon, and in particular that place where the sun is vertical; those places that have morning or evening twilight; and those places where it is midnight.*—Find the sun's place in the ecliptic for the given day, bring it to the brazen meridian, and mark its declination.

Elevate the (north or south) pole as many degrees above the horizon as are equal to the sun's declination (north or south). Bring the given place to the meridian, and set the index to the given hour, then turn the globe on its axis, till the index comes to the upper twelve, and fix the globe in that position. All these places along the western edge of the horizon have the sun rising, those along the eastern edge have the sun setting: it is noon to the places under the brazen meridian, and amongst them the sun is vertical to that place, which stands under the degree of the sun's declination.

Those places that are within 18° of the western semi-circle of the horizon have morning twilight, and those within 18° of the eastern semi-circle have evening twilight: and it is midnight at all those places under that part of the brazen meridian which is below the horizon. In short, it is day to all places above the horizon, and either twilight or dark night to all those which are below it.

*The day and hour of a lunar eclipse being given, to find those places where it will be visible.*—Find the place where the sun will be vertical when the eclipse begins, and rectify the globe, in respect to latitude, for the antipodes of that place. Then bring the antipodes to the upper part of the brazen meridian, and fix the globe in that position, and the beginning of the eclipse will be visible to all places which are then above the horizon.

*To find the proportion which the land bears to the sea.*—For this purpose Dr. Long proposes to take the papers of a large terrestrial globe, and after separating the land from the sea with a pair of scissors, to weigh them exactly in scales. This method supposes the globe to be exactly delineated, and all the papers of equal thickness. By an experiment on the papers of Mr. Seax's seventeen inch globe, he found that those comprehending the sea weighed 349 grains, and the others only 124; whence he infers, that almost three-fourth parts of the surface of our earth between the polar circles are covered with water, and that little more than one-fourth is dry land. Dr. Long omitted weighing the papers within the polar circles, because the proportion which the land bears to the sea within them is not ascertained. Long's Astron. vol. i. p. 168. See *Magazine of the Earth*.

GLOBE, *To construct a new by the.* See DIAM.

The celestial globe has been improved by Mr. Ferguson: in this globe, (*Plate XV. Astronomy, fig. 122.*) an arch MKH, of 23½°, is fixed on the north pole of the axis, above the hour circle; and at the end is fixed an upright pin HG, standing

standing directly over the north pole of the ecliptic, and perpendicular to that part of the surface of the globe. On this pin are two moveable collets at D and H, to which are annexed the quadrantal wires N and O, carrying two little balls representing the sun and moon. The collet D is fixed to the circular plate F, on which are engraven the 29½ days of the moon's age, beginning under the wire N, which wire, as it turns round, carries with it the plate F. These wires are fixed or slackened by the screw G, and the two little balls are made to rise and set at the same time and on the same point of the horizon, for the day to which they are rectified, as the sun and moon do in the heavens. The ball representing the moon may be screwed as many degrees to either side of the ecliptic, as her latitude amounts to at any given time; and for this purpose, S is a small piece of pasteboard, the curved edge of which at S is to be set upon the globe at right angles to the ecliptic, and the dark line over S to stand upright upon it: from this line, on the convex edge, are drawn the 5½ degrees of the moon's latitude on both sides of the ecliptic; and when this piece is set upright on the globe, its graduated edge reaches to the moon on the wire O, by which means she is easily adjusted to her latitude found by an ephemeris. The horizon of this globe is supported by two semi-circular arches, because pillars would stop the progress of the balls, when they go below the horizon in an oblique sphere. This globe is rectified by elevating the pole to the latitude of the place, bringing the sun's place in the ecliptic for the given day to the brazen meridian, and setting the hour-index to twelve at noon; then, setting the sun directly over his place in the meridian, and the moon over her place in the ecliptic, by fixing her wire under the number that expresses her age for that day on the plate F; and, lastly, laying the curved edge of the pasteboard S over the ecliptic below the moon, and adjusting the moon to her latitude over the graduated edge of the pasteboard. Having thus rectified the globe, turn it round, and observe on what point of the horizon the sun and moon balls rise and set; for these agree with the points of the compass on which the sun and moon rise and set in the heavens on the given day: and the hour-index shews the times of their rising and setting, and also the time of the moon's passing over the meridian. This globe is also contrived for exhibiting the phenomena of the harvest-moon, &c. Phil. Trans. N<sup>o</sup> 483, art. 21. in vol. xlv. p. 535, or Ferguson's Astron. p. 291.

GLOBE, *Dialling*. See DIALING.

GLOBES, *Patent*, are those with the improvements of Mr. Neale, for which he obtained his majesty's letters patent; by means of which he solves several astronomical problems, which do not admit of solution by the common globes.

GLOBE, *Planetary*, is a machine contrived and described by Mr. Ferguson; in which T (*Plate XV. Astronomy, fig. 123*) is a terrestrial globe fixed on its axis standing upright on the pedestal C D E, on which is an hour circle, having its index fixed on the axis, which turns somewhat tightly in the pedestal, so that the globe may not be liable to shake: to prevent which, the pedestal is about two inches thick and the axis goes quite through it, bearing on a shoulder. The globe is hung in a graduated brazen meridian, much in the usual way; and the thin plate N, N E, E, is a moveable horizon graduated round the outer edge, for shewing the bearings and amplitudes of the sun, moon, and planets. The brazen meridian is grooved round the outer edge; and in this groove is a slender semi-circle of brass, the ends of which are fixed to the horizon in its north and south points: this semi-circle slides in the groove as the

horizon is moved in rectifying it for different latitudes. To the middle of the semi-circle is fixed a pin, which always keeps in the zenith of the horizon, and on this pin the quadrant of altitude *q* turns; the lower end of which, in all positions, touches the horizon as it is moved round the same. This quadrant is divided into 90 degrees from the horizon to the zenithal pin on which it is turned, at 90. The great flat circle or plate A B is the ecliptic, on the outer edge of which the signs and degrees are laid down; and every fifth degree is drawn through the rest of the surface of this plate towards its centre. On this plate are seven grooves, to which seven little balls are adjusted by sliding wires, so that they are easily moved in the grooves, without danger of starting out of them. The ball next the terrestrial globe is the Moon, the next without it is Mercury, the next Venus, the next the Sun, then Mars, then Jupiter, and lastly Saturn; and in order to know them, they are separately stamped with the following characters: ☿, ♀, ♁, ☽, ♃, ♄, ♅. This plate or ecliptic is supported by four strong wires, having the lower ends fixed into the pedestal at C, D, and E, the fourth being hid by the globe. The ecliptic is inclined 23½ degrees to the pedestal, and is therefore properly inclined to the axis of the globe which stands upright on the pedestal.

*To rectify this machine*.—Set the Sun, and all the planetary balls, to their geocentric places in the ecliptic for any given time, by an ephemeris; then set the north point of the horizon to the latitude of your place on the brazen meridian, and the quadrant of altitude to the south point of the horizon; which done, turn the globe with its furniture till the quadrant of altitude comes right against the Sun, *viz.* to his place in the ecliptic; and keeping it there, set the hour index to the XII. next the letter C.

By this machine the following problems, as well as many others, may be resolved.

*To find the amplitude, meridian altitudes, and times of rising, culminating, and setting of the sun, moon, and planets*.—Turn the globe round eastward, or according to the order of the signs; and as the eastern edge of the horizon comes right against the sun, moon, or any planet, the hour-index will shew the time of its rising; and the inner edge of the ecliptic will cut its rising amplitude in the horizon. Turn on, and as the quadrant of altitude comes right against the sun, moon, or planets, the ecliptic cuts the meridian altitudes in the quadrant, and the hour-index shews the times of their coming to the meridian. Continue turning, and as the western edge of the horizon comes right against the sun, moon, or planets, their setting amplitudes are cut in the horizon by the ecliptic; and the times of their setting are shewn by the index on the hour-circle.

*To find the altitude and azimuth of the sun, moon, and planets, at any time of their being above the horizon*.—Turn the globe till the index comes to the given time in the hour-circle; and keep the globe steady, and moving the quadrant of altitude to each planet respectively, the edge of the ecliptic will cut the planet's mean altitude on the quadrant, and the quadrant will cut the planet's azimuth, or point of bearing on the horizon.

*The sun's altitude being given at any time either before or after noon, to find the hour of the day, and the variation of the compass, in any known latitude*.—With one hand hold the edge of the quadrant right against the sun; and, with the other hand, turn the globe westward, if it be in the forenoon, or eastward if it be in the afternoon, until the sun's place at the inner edge of the ecliptic cuts the quadrant in the sun's observed altitude; and then the hour-index will point out

the time of the day, and the quadrant will cut the true azimuth, or bearing of the sun for that time: the difference between which, and the bearing shewn by the azimuth compass, shews the variation of the compass in that place of the earth. Ferguson's Astron. p. 292, &c.

GLOBE *Amaranth.* See GOMPHRENA.

GLOBE *Animalcule*, in *Natural History*, is a singular, minute, aquatic animal, whose form seems exactly globular, without either head, tail, or fins. It moves in all directions, either rolling like a bowl, or gliding along smoothly without turning itself at all. Its whole body is transparent, except where it is covered with circular black spots; some of which have six or seven, some one, two, three, four or five, and others none at all. These spots are probably the eggs, or young ones of the animal. The general appearance of the body exhibited a kind of short moveable hairs or bristles, by means of which it is conjectured the motions of the animal may be performed. Baker's Microf. 1753, p. 322, &c.

GLOBE, *Daisy.* See GLOBULARIA.

GLOBE *Fish*, in *Ichthyology*, a name by which some species of the ostracion are called. See OSTRACION.

GLOBE *Flower*, in *Botany.* See SPHERANTHUS.

GLOBE *Ranunculus.* See TROLLIUS.

GLOBE *Thistle.* See ECHINOPS.

GLOBULAR CHART, a representation of the surface, or some part of the surface, of the terraqueous globe upon a plane; wherein the parallels of latitude are circles nearly concentric: the meridians, curves, bending towards the poles; and the rhumb-lines also curves.

The merits of this chart consist in this, that the distances between places on the same rhumb are all measured by the same scale of equal parts; and the distance of any two places in the arch of a great circle, is nearly represented in this chart by a straight line. Hence land-maps, made according to this projection, would indisputably have great advantages above those made any other way. See MAP.

But for sea charts, and the use of navigation, it is yet controverted, whether the globular chart be preferable to Mercator's, where the meridians, parallels, and particularly the rhumb-lines, are all straight lines; inasmuch as straight lines are found more easy to draw and manage than curves, especially such as rhumb-lines on the globular chart are. This projection is not new, though not much taken notice of till of late. It is mentioned by Ptolemy in his Geography; as also by Blundeville, in his Exercises. See CHART.

GLOBULAR *Projection.* See PROJECTION.

GLOBULAR *Sailing.* See Great-circle SAILING.

GLOBULARIA, in *Botany*, was so called by Tournefort, because its flowers grow in the shape of a little globe or ball.—Linn. Gen. 47. Schreb. 63. Willd. Sp. Pl. v. 1. 539. Ait. Hort. Kew. ed. 2. v. 1. 222. Mart. Mill. Diét. v. 2. Lamarek Dict. v. 2. 730. Illustr. t. 56. Journ. t. 265. Gærtn. t. 44. Juss 97.—Class and order, *Tetrandria Monogynia*. Nat. Ord. *Aggregata*, Linn. *Lyfmachia*, Juss.

Gen. Ch. *Cal.* Common perianth imbricated, with equal scales, the length of the disk; proper perianth of one leaf, tubular, five-cleft, acute, permanent. *Cer.* General one nearly equal; proper one of a single petal, tubular at the base; limb in five segments; the upper lip very narrow, cloven, shortest; the lower consisting of three larger, equal segments. *Stam.* Filaments four, simple, as long as the proper corolla; anthers distinct, incumbent. *Pist.* Germen superior, ovate; style simple, the length of the stamens; stigma obtuse. *Peric.* none; proper calyx shutting up and

enclosing the solitary, ovate seeds. Common receptacle oblong, divided by scales.

Ess. Ch. Common calyx imbricated; proper one tubular, inferior. Partial corollas with the upper lip cloven; under one three-cleft. Receptacle chaffy.

1. *G. longifolia.* Long-leaved Globularia. Willd. Sp. Pl. v. 1. 539; (Alypum five Herba terribilis; Sloan. Jam. v. 1. 19. t. 5. f. 3.)—"Stem shrubby. Leaves linear-lanceolate, entire. Heads of flowers axillary."—This green-house shrub is a native of Madeira, flowering in July and August. The wood of this plant is hard and white, with a very large pith, and an unequal light brown or grey bark. Leaves growing very thick towards the ends of the branches. Flowers consisting of several spherical heads, of a bluish colour. Seed pappous, all over downy.

2. *G. Alypum.* Herb Terrible. Linn. Sp. Pl. 139. (Alypum montis Ceti; Ger. em. 506.)—"Stem shrubby. Leaves obovato-lanceolate, three-toothed or undivided. Heads of flowers terminal."—A green-house shrub, found in various parts of the south of Europe, flowering from August to November. Root woody. Leaves alternate, fasciculated in the lower axilla, near an incl. long, glaucous, some are undivided, others three-toothed. Flowers blue or purple. The whole plant is bitter, and purgative to a violent degree.

3. *G. bifnagarica.* Linn. Sp. Pl. 139. (Scabiosa bifnagarica five *G. frutescens*; Pluk. Amath. t. 58. f. 5.)—"Stem shrubby. Radical-leaves wedge-shaped, abrupt; stem-leaves lanceolate."—Native of the woods of India. Stem of many straight, hard, leafy branches, each about five or six inches high. Flowers in a blue terminal head.

4. *G. vulgaris.* Blue Daisy. Linn. Sp. Pl. 139. (Aphyllanthes anguillara; Camer. Hort. t. 7.)—"Stem herbaceous. Radical-leaves three-toothed. Stem-leaves lanceolate."—A hardy perennial, common in some parts of Europe, and flowering in May and June. Root woody. Stem a span high, terminated by a head of deep blue flowers. Willdenow mentions two varieties of this species, one with a leafless stem, the other with white flowers.

5. *G. spinosa.* Linn. Sp. Pl. 139.—"Radical-leaves crenate-prickly; stem-leaves entire, pointed."—Native of Spain, Albinus having gathered it in Granada. It flowers in May.—Radical-leaves numerous, small, stiff and notched, each notch ending in a prickle. Flowers composing an oblong sphere, hairy.—We are not acquainted with any figure of this species.

6. *G. cordifolia.* Linn. Sp. Pl. 139. Jacq Austr. t. 245.—"Stem nearly naked. Leaves wedge-shaped, with three points; the middle one very small."—Native both of hills and vales in Hungary, Austria, and Switzerland, flowering from April to July. Root creeping, each joint throwing out a cluster of leaves, from the centre of which springs a smooth purplish stem about four inches long, terminated by a head of blue flowers.

7. *G. nana.* Willd. Sp. Pl. v. 1. 542.—"Flower-stalks naked, very short, leaves spatulate, somewhat ovate, entire."—Found in the south of France, and on the Pyrenees, where our dried specimen was gathered by Dr. Noëthen.—Root woody and very thick, bearing numerous tufts of little leaves, among which arise the short, solitary, flower-stalks. Flowers forming a terminal head.—It has never been figured.

8. *G. nudaensis.* Linn. Sp. Pl. 140. Jacq Austr. t. 230.—"Stem naked, leaves entire lanceolate."—Native of mountainous and stony places in Austria and Switzerland, flowering in July.—Root perennial, fibrous, creeping, throwing out numerous, thickish, firm leaves, darker on the upper

per side. *Flower-stalk* about six inches long, smooth, striated, purplish towards the top, bearing a roundish head of blue flowers.

9. *G. orientalis*. Linn. Sp. Pl. 145 — "Stem nearly naked. Heads of flowers alternate, sessile, leaves ovate, somewhat lanceolate, entire." — This species is a native of Natchez. — *Root* perennial. *Leaves* numerous, obovate, running down into the foot-stalks, acute, undivided, naked. *Stem* a foot high, herbaceous, perfectly simple. *Leaves* alternate, small, lanceolate, remote. *Heads of flowers* alternate, sessile, from seven to ten, at the summit of the stem. — Linnæus described *G. orientalis*, having received it from M. Biorling, but it is nowhere figured.

**GLOBULARIA**, in *Gardening*, contains plants of the herbaceous, showery, perennial kind; of which the species chiefly cultivated are the three-tooth-leaved globularia (*G. alypum*); and the common globularia or blue daisy (*G. vulgaris*); but others may be easily raised.

There are two varieties of the last sort, one with a white flower, and another that has a leafless stem.

*Method of Culture*. — In the first it may be effected by planting cuttings of the young branches in April, just before they begin to shoot, in pots of light fresh mould, plunging them in a very moderate hot-bed, and giving them due water and shade, till they have striken root. After this they should be removed from the bed, and be gradually hardened to the open air, being protected during the winter months.

The second sort may be readily increased by parting the roots, as in the common daisy, planting them out in the early part of the autumn, in moist shady situations. They succeed best in such loamy soils as are rather moist in their quality.

The first affords variety among potted plants, and the latter in the fronts of the more moist and shady borders and clumps of pleasure-grounds.

**GLOBULE**, **GLOBULUS**, a little globe; otherwise called a *spherule*.

Thus the red particles of the blood are called globules of the blood, on account of their redness and smallness. (See **BLOOD**.) The Cartesianians call the particles broken off the matter of the first element, *globules of the second element*. See **CARTESIAN**, &c.

**GLOBULUS NASI**, is used for the lower, flexible, cartilaginous part of the nose.

**GLOCHIDION**, in *Botany*. See **BRADLEJA**.

**GLOESZT**, in *Geography*, a town of Walachia; 50 miles N. of Bucharest. N. lat. 49° 13'. E. long. 26 16'.

**GLOGAU**, a principality of Silesia, on the E. side of the Oder, bordering on Poland; producing corn and wine in abundance, in some parts affording mines of iron. The pastures feed many sheep, and the wool is wrought into different manufactures. It is divided into six circles. In the year 1241, it was governed by its own princes; but afterwards it belonged to the king of Poland, to the king of Bohemia, to the emperor, and last of all to the king of Prussia.

**GLOGAU**, *Gros* or *Great*, the capital of the principality of the same name, built in 1110 on the S. side of the Oder, taken by the Prussians in 1741, and strengthened by new fortifications. It is the seat of a governor, a commandant, divers tribunals, and a bishop's court, &c. It contains two Catholic churches, of which one is collegiate, three convents, a Lutheran church and school, and a chapel for Calvinists; 62 miles N.W. of Breslau. N. lat. 51° 39'. E. long 16 5'.

**GLOGAU**, *Ober*, or *Little*, a town of Silesia, in the prin-

cipality of Oppeln; 19 miles S. of Oppeln. N. lat. 53° 16'. E. long. 17° 48'.

**GLOGNITZ**, a town of Austria; 28 miles S. of Vienna.

**GLOKEN-SPEISSE**, in *Mineralogy*, a term used by the Germans to express a sort of impure regulus of bismuth, obtained by accident, sometimes in the making of fire. The bismuth ores are often so intimately mixed with the cobalt, that they cannot be separated from them. In this case, the arsenic being raised in the flowers, there remains at the bottom, instead of the fixed vitrifiable earth of the cobalt, a sort of impure regulus of a reddish colour. This is bismuth, with an admixture of the earth of cobalt, and other extraneous matter. They sometimes call this whole matter by the common name of speisse; but more usually they separate it into two parts, and call the under part, which is moist solid, gloken-speisse, and the upper part they distinguish by the name of *as caldarium*.

**GLOMERELLS**, in our *Old Writers*, commissaries appointed to determine differences between scholars of a school or university, and the townsmen of a place. In the edict of the bishop of Ely, anno 1276, there is mention of the master of the glomerells.

**GLOMME**, or **GLOMEX**, in *Geography*, called also the *Stor Ely*, or great river, the chief river of Norway, springs from the lake of Oresund on the north of the Fœmund, and after running a course nearly south about 300 British miles, discharges itself into the Northern Ocean near Frederikstad, to which town about 50,000 trees are annually floated upon it. This river, being full of cataracts and shoals, is not navigable. Before it receives the Worme, which issues from the lake Miosf, it is about as broad as the Thames at Henley. In its course it presents a broad surface, sometimes watering pleasant vallies, sometimes intercepted by sand-banks, over which it frequently shifts its course, sometimes winding between rocky cliffs, and precipitating itself in frequent cataracts. Near Kongsvinger it is as broad as the Thames at Putney. Its rugged course, however, must render it a tremendous torrent.

**GLOM**, a river of Bavaria, which runs into the Ammer, near Crantzberg.

**GLONS**, a town of France, in the department of the Ourte, and chief place of a canton, in the district of Liege. The place contains 1,500, and the canton 8,850, inhabitants, on a territory of 107½ kilometres, in 23 communes.

**GLOR-FAT**, in *Rural Economy*, a term applied to animals that are extremely fat.

**GLORIA PATRI**, in the *Liturgy*, a formula of words repeated at the end of each Psalm, and on other occasions, to give glory to the Trinity; called also the *Doxology*. It is thus denominated, because it begins in the Latin office with these words; *Gloria Patri*, q. d. *Glory be to the Father*, &c.

Pope Damasus is commonly said to have first ordered the rehearsal, or rather, singing the Gloria Patri at the end of Psalms. Baronius, indeed, will have it to have been used in the times of the apostles; but its use, then, he allows to have been more obscure, and that it did not become popular till after the rise of Arianism, when it was made a kind of symbol of orthodoxy.

The fifth canon of the council of Vaison, held in 529, decrees, "that the name of the pope shall always be rehearsed in the churches of France, and after the Gloria Patri shall be added *sicut erat in principio*, as is done at Rome, in Africa, &c. on account of the heretics, who



say, that the Son of God had his beginning in time." Henry.

**GLORIA** in *excelsis* is also a kind of hymn rehearsed in divine service, beginning with the words *Gloria in excelsis Deo, &c. in terra pax hominibus, &c. Glory be to God on high, on earth peace, &c.*

**GLORIOSA**, in *Botany*, so named on account of the splendour and magnificence of its flowers. Tournefort, objecting to the name given by Linnæus because it is an adjective, called this genus *Melchonia*, in which he has been followed by Jussieu, and indeed by all French botanists, though the Linnæan school have refused to adopt this barbarous name.—Linn. Gen. 164. Schreb. 220. Willd. Sp. Pl. v. 2. 95. Ait. Hort. Kew. v. 1. 434. Mart. Mill. Dict. v. 2. Gartn. t. 18. Juss. 48.—Class and order, *Hexandria Monogynia*. Nat. Ord. *Sarmentaceæ*, Linn. *Lilia*, Juss.

Gen. Ch. Cal. none. Cor. Petals six, oblong-lanceolate, waved, very long, entirely bent back, furnished at the base of their inside with a honey-bearing furrow, between two ridges. Stam. Filaments six,awl-shaped, shorter than the corolla, horizontal; anthers incumbent. Pist. Germen globose; style thread-shaped, longer than the stamens, horizontal; stigmas three, thread-shaped. Peric. Capsule superior, oval, with three lobes, three cells, and three valves. Seeds numerous, globular, covered with pulp, and disposed in two rows.

Eff. Ch. Corolla of six waved and reflexed petals. Style oblique.

1. *G. superba*. Superb Lily. Linn. Sp. Pl. 437. Redout. Liliac. t. 26.—“Leaves furnished with tendrils.”—Native of Malabar and Guinea. It was introduced into Kew Garden in 1690 by the first earl of Portland. A tender stove plant, flowering in July and August. The stem is herbaceous, about a fathom high, round, having two opposite lateral branches, and putting forth a flower-stalk from the bosom of each leaf. Leaves alternate, smooth, each ending in a tendril. Flowers pendent, of a most beautiful red and yellow colour. Petals lanceolate, long, waved at the edge, reflexed near the base. This remarkably handsome plant requires excessive heat to make it flower.

2. *G. simplex*. Linn. Munt. 62. Willd. Sp. Pl. v. 2. 95.—“Leaves pointed.”—Native of Senegal. The leaves are not furnished with tendrils. Flowers blue.—There is no figure of this species known. It was merely taken up from Miller, nor has any thing been found which answers to the description.

Obs. This very beautiful genus is nearly allied to *Erythronium*.

**GLORIOSA**, in *Gardening*, comprises a plant of the herbaceous, flowering perennial kind; of which the species cultivated is the superb-lily (*G. superba*.)

*Method of Culture*.—It is capable of being increased by planting the offsets from the old roots, either in the autumn after the stems decay, or in the early spring before they shoot, in pots filled with light earth, plunging them in the bark-bed of the stove. The old roots, when taken out of the ground, should be preserved in dry sand during the winter in the stove, or in a dry warm room. It is the practice of some to let the roots remain during the winter in the mould, keeping the pots in the tan-bed; planting out the offsets early in the spring. In either way they should have very little water given them.

When the stems appear they should be supported by sticks, and in hot dry weather a little water should be sparingly given, as there may be occasion. And the pots in which they are planted should be small, that they may be confined, and put forth stronger stems. Two-penny pots will be large

enough for the roots of the greatest sized plants of this nature.

The plants afford much effect by their beautiful flower, among those of the stove kind, when properly intermixed with them.

**GLORIOUS ISLANDS**, in *Geography*, two small islands in the Indian sea. S. lat. 11 32'. E. long. 47° 15'.

**GLOSKAR**, a small island in the Baltic. E. of Aland. N. lat. 60 20'. E. long. 20 13'.

**GLOSS**, **GLOSSA**, a comment on the text of any author, to explain his sense more fully and at large, whether in the same language, or in any other. See **COMMENTARY**.

The word, according to some, comes from *glossos, tongue*; the office of a gloss being to explain the text, as that of the tongue is to discover the mind. Others derive it from the Latin *glossæ*, of *glossæ, a filler-in-lace*, which among lawyers sometimes stands for filler; the gloss being, as it were, later to the text.

Nic. de Lyra composed a postil or gloss on the Bible, in six volumes folio. The French say, proverbially of an ill comment, that it is *glosses d'Orleans, plus obscure que le texte*.

**GLOSS** is also used for a literal translation, or an interpretation of an author in another language, word for word. Young scholars need an interlinear gloss for the understanding of Juvenal, Horace, Sallust, Persius, &c.

**GLOSS** is also used in matters of *Commerce*, &c. for the lustre of silk, stuff, or the like.

**GLOSSARY**, **GLOSSARIUM**, a kind of dictionary for explaining the obscure, ancient, and barbarous words and phrases of an altered, corrupted, or refined language.

Speiman's glossary, entitled *Archæologicum*, is an excellent work; though that author did not begin to study in this way till fifty years of age. M. Du Cange's Latin Glossary in six volumes, Paris, fol. 1733, Basil, fol. 1762, is a work in high estimation, and containing a fund of the most curious and amusing intelligence. Charpentier's supplement to this work, in 4 volumes, fol. Paris, 1766, is necessary to render this set of books complete. Du Cange's Greek Glossary in two volumes, fol. Lugd. 1688, is an excellent performance, full of uncommon erudition.

The Greek, Latin, and French glossaries of Du Cange form a series of the most instructive articles in the study of jurisprudence and belles lettres. There is an abridgment of this work in 6 vols. 8vo.; which, however, contains some matter not common to either of the preceding. This abridgment is exceedingly rare. As a caution to the purchasers of the Greek Glossary, we inform them that in the article “*Moneta*” (Coins, vol. iv. p. 924.) there should be 10 plates of engravings of coins, and monograms of various princes and sovereigns of Europe, which are sometimes wanting, and thus the value of the edition is materially depreciated.

Lindembroek has a Glossary on the laws of Charlemagne, &c.

**GLOSSOCATOCHOS**, in *Surgery*, an instrument for depressing the tongue. It is described by Paulus Ægineta, and the term is derived from *γλωσσα, the tongue*, and *κατοχος, to press*.

**GLOSSOCELE**, denoting a swelling and protrusion of the tongue. The word comes from *γλωσσα, the tongue*, and *κελε, a tumour*.

**GLOSSOCOMA**, a retraction of the tongue.

**GLOSSOCOME**, in the *Instrumental Music of the Greeks*, a name given by the ancients to a kind of cane for the glottis, or tongues of their flutes, which probably were hautboys, and, consequently, their glottis was a reed. See **GLOTTIS**.

**GLOSSOCOMON**, in *Mechanics*, is a name given by Hiero.

ero, to a machine composed of divers dented wheels, with pinnions serving to raise huge burdens.

**GLOSSOCOMON**, a term in *Surgery*, derived from *γλωσση*, the tongue, and *κρυμα*, to guard; originally a case for the reed of a hautboy, but used metaphorically to signify a case for a fractured limb.

**GLOSSODIA**, in *Botany*, (*γλωσσοειδης*, having the form or appearance of a tongue; in allusion to the peculiar appendage to the internal part of the flower, which resembles the tongue of a serpent, and affords the essential character. Brown Prod. Nov. Holl. v. 1. 325.—Class and order, *Gynandria Monogynia*. Nat. Ord. *Orchideæ*.)

Gen. Ch. *Cal.* Perianth superior, of three equal spreading leaves. *Cor.* Petals two, equal to and resembling the calyx. Nectary of a different form, shorter, undivided, not glandular, accompanied, at its base above, by a cloven tongue-shaped appendage, between it and the style. *Stam.* Anther terminal, its cells close together; masses of pollen two in each cell, compressed, powdery. *Pist.* Germen inferior: style columnar, with a dilated membranous border at each side. *Peric.* Capsule. *Seeds* numerous.

Eff. Ch. Calyx and Corolla equal. Lip shorter, undivided, without glands, with an appendage at its base. Style dilated at each side. Anther vertical.

1. *G. major*. Brown 326.—“Appendage cloven half way down; its lobes spreading, acute.”

2. *G. minor*. Ibid.—“Appendage cloven to the base; its lobes parallel, obtuse.”

Both species are natives of the country near Port Jackson, New South Wales. Their *bulbs* are undivided, with a laminated coat, and grow in the earth, not parasitically. *Herb* hairy. *Leaf* solitary, radical, its base enclosed in a membranous sheath. *Stalk* radical, bearing generally one blue flower, rarely two, and furnished with one *bractea* besides what accompanies each flower. *Brown*.

**GLOSSOIDES**, in *Natural History*, a name given by some authors to a species of stone, resembling the figure of the human tongue. This is a mere accidental configuration of a common flint or pebble, perfectly indeterminate in size and colour, and owing its form to no animal mould, as the stones found in shells usually do, but is a mere *lusus naturæ* in the concretion of the stone.

**GLOSSOMA**, in *Botany, so named by Schreber, from *γλωσση*, the tongue, and *ωπος*, the shoulder, alluding to the tongue-shaped appendages borne by the anthers. Schreb. 792. Willd. Sp. Pl. v. 1. 664. Mart. Mill. Dict. v. 2. (Votomita; Aubl. Guian. v. 1. 90. Juss. 382.) Class and order, *Tetrandria Monogynia*. Nat. Ord. *Rhannis affine*, Juss.*

Gen. Ch. *Cal.* Perianth superior, of one leaf, turbinate, four-toothed, permanent. *Cor.* Petals four, equal, lanceolate, acute, much longer than the calyx, recurved. Nectary a ring round the base of the style. *Stam.* Filaments four, very short; anthers oblong, nearly united into a cylinder, elongated at the top into a membranous lanceolate expansion of two cells, opening inwardly. *Pist.* Germen inferior, obovate; style thread-shaped, as tall as the stamens; stigmas four, acute. *Peric.* Drupa pear-shaped, of one cell, crowned by the calyx. *Seed* solitary, ovate, striated.

Eff. Ch. Calyx superior, four-toothed. Petals four. Anthers cohering, each crowned with a lanceolate membrane. Stigmas four. Drupa with one furrowed nut.

Obf. The above characters appear to be taken by Schreber from Aublet, nor have we any better materials. The only species known is,

1. *G. arborefcens*; Willdenow. (Votomita guianensis; Aubl. v. 1. 91. t. 35.)—A *shrub* of a middling size, whose trunk is five or six feet high, and five or six inches thick;

the wood yellow, hard and compact. *Branches* knotty, spreading variously, leafy. *Leaves* opposite, elliptical, pointed, entire, six inches long, thick and firm, of a shining green, placed on short stalks, with a deciduous stipula at each side of their base. *Flowers* white, on short, umbellate, axillary stalks, their petals about half an inch long. This plant is found in the extensive forests of Guiana, about the habitations of the natives. Nothing is recorded respecting its qualities or uses.

**GLOSSOPETALUM**, so denominated by Schreber from the tongue-like appendages to the petals. Schreb. 205. Willd. Sp. Pl. v. 1. 1521. Mart. Mill. Dict. v. 2. (Goupia; Aubl. v. 1. 295. Juss. 378. Lamarck. Illustr. t. 217.)—Class and order, *Pentandria Pentagynia*. Nat. Ord. *Dumoseæ*, Linn. *Rhamnii*, Juss.

Gen. Ch. *Cal.* Perianth half inferior, of one leaf, minute, five-toothed, permanent. *Cor.* Petals five, lanceolate, spreading, acute, much longer than the calyx, each bearing at its point a linear-lanceolate, abrupt appendage, almost the length of the petal, bent back and lying upon it. *Stam.* Filaments five, very short; anthers roundish. *Pist.* Germen roundish, encircled by a glandular ring, which bears the petals and stamens; style none; stigmas five, acute. *Peric.* Berry roundish, with five furrows, of one cell. *Seeds* five, angular.

Eff. Ch. Calyx half inferior, with five teeth. Petals five, each bearing an inflexed longitudinal appendage. Berry with five seeds.

Obf. Schreber, p. 826, suspects this genus not to be distinct from *Aralia*, but the habit confirms Jussieu's opinion, who separates them widely. Two species are described by Aublet.

1. *G. glabrum*. (Goupia glabra; Aubl. v. 1. 296. t. 116.)—“Leaves smooth.”—Native of the forests of Guiana, 30 leagues from the sea, bearing flowers and fruit in November. The *trunk* is 60 feet or more in height, and two or three feet in diameter, serving to make canoes; the bark smooth and grey; the wood white and light. *Branches* drooping, furnished with alternate *leaves* of an ovate, pointed, somewhat unequal figure, entire, rigid, shining, and smooth, with a branching rib, and fine transverse veins at the back. *Flowers* yellow, small, many together in solitary axillary umbels. *Berry* black, globular.

2. *G. tomentosum*. Willd. Sp. Pl. v. 1. 1522.—“Leaves downy.”—Native of the forests of Cayenne and Guiana. Not half so lofty as the former. The *bark* is wrinkled and dark-coloured. *Leaves* clothed on both sides with some short hairs. Their juice, which, as well as the bark, is bitter, is used to cure inflammations of the eyes.

**GLOSSOPETRA**, or **GLOTTOPETRA**, in *Natural History*, called also *ichthyodontes*, *shark's teeth*, *dog-fish's teeth*, &c. a kind of extraneous fossil, somewhat in form of a serpent's tongue; frequently found in the island of Malta and divers other parts. Some of them are in a high state of preservation, having their enamel and points perfect, and their sharp edges finely serrated as in the recent teeth.

Naturalists have been much divided as to the nature and origin of these bodies. Steno, De Corpore solido intra solidum contento; Ol. Wormius, Dissert. de Glossopetra; and Reyfchius. De Glossopetris Lunebergensibus, treat of them at large.

The vulgar notion is, that they are the tongues of serpents petrified; and hence their name, which is a compound of *γλωσση*, tongue, and *πετρα*, stone. Hence, also, their traditional virtue in curing the bites of serpents.

The general opinion of naturalists is, that they are the teeth

teeth of fishes, left on land by the waters of the deluge, and since petrified.

They even specify the very kind of fish, and take it to be that which Theophrastus and the Greek writers call *καρχαρία*, and the moderns the *shark* or *sea-dog*.

Camerarius cannot persuade himself that the *glossopetra* found in England, Malta, and round Montpellier, were ever the teeth of a sea-dog, or any other fish. The chief difficulty, he suggests, is the small quantity of volatile salt and oil which they afford by distillation. To which Dr. Woodward answers, in defence of the common system, that having lain so long buried under ground, it is no wonder they should have lost the best part of their volatile principles. It is certain, that human bones and skulls, long interred, do not afford nearly the quantity of those principles that they would have done immediately after the person's death.

Another scruple, proposed by Camerarius is, that the *glossopetra*, when exposed to the naked fire, turn to a coal; and not to a calc; contrary to what is asserted by Fabius Columna. Dr. Woodward answers, that it is likely enough the *glossopetra*, in burning, may assume the form of a coal, before it arrive to that of a calc.

The several sizes of the teeth of the same species, and those of the several different species of sharks, afford a vast variety of these fossil substances. Their usual colours are black, blueish, whitish, yellowish, or brown; and in shape they usually approach to a triangular figure. Some of them are simple; others are tricupidate, having a small point on each side of the large one; many of them are quite straight, but they are frequently found crooked, and bent in all directions; many of them are serrated on their edges, and others have them plain: some are undulated on their edges, and slightly serrated on these undulations. They differ also in size as much as in figure; the larger being four or five inches long, and the smaller of less than a quarter of an inch.

They are most usually found with us in the strata of blue clay, though sometimes also in other substances, and are frequent in the clay-pits of Richmond and of Sheppy island, and in other places. They are very frequent also in Germany, but nowhere so plentiful as in the island of Malta. In the British strata they rarely occur. Mr. Farey has found them in these strata only in five places, *viz.* in the London clay, probably obtained from the clay-pits above-mentioned; in a bed of the soft or upper chalk in Kent, at Harefield, near New Malton, &c.; in a green sandy stratum below the chalk, N. of Dunstable, &c.; in the Stonesfield and Collywellton slate series, above the Bath free-stone rocks, at Enstone in Oxfordshire, where Woodward procured specimens of these teeth in the jaw, &c.; and in the thick grey lime-rock which lies under and surrounds the South-Wales coal basins (Phil. Trans. N<sup>o</sup> 334.) *Glossopetra* are sometimes found in gravel-pits and other collections of alluvial matters. It is seldom possible to determine to what place in the series of strata these belong, and they should therefore be carefully distinguished from such as are actually found in the strata.

The Germans attribute many virtues to these fossil teeth: they call them cordials, sudorifics, and alexipharmics: and the people of Malta, where they are extremely plentiful, hang them about their children's necks to promote dentition. They may possibly be of as much service this way as an anodyne necklace; and if suspended in such a manner that the child can get them to its mouth, may, by their hardness and smoothness, be of the same use as a piece of coral. See *Serpent's Tongues*.

**GLOSSO-PHARYNGEUS**, in *Anatomy*, from *γλωσσα*,  
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*the tongue*, and *φαρυγξ*, a name given to those fibres of the constrictor pharyngis superior, which arise from the side of the tongue.

**GLOSSO-SPATHA**, in *Surgery*, an instrument, called by some *speculum linguae*, and used to depress the tongue, in order to look into the fauces.

There are many inflammatory disorders of the mouth, fauces, and palate, which require a depression of the tongue, while they are inspected and treated with proper remedies. The handle of a silver spoon is made to supply the place of this instrument in most cases, and answers the purpose very well. Whichever is used, care should be taken to depress very gently, to avoid giving the patient pain, as also to avoid irritating the mouth and inflamed parts.

When injections are to be made into the mouth, this instrument or the spoon should also be applied, and the syringe should be conveyed into the mouth over it.

**GLOSSO-STAPHYLINUS**, in *Anatomy*, from *γλωσσα*, *the tongue*, and *σταφυλη*, *the uvula*, another name for the constrictor isthmi faucium. See *DEGLUTITION*.

**GLOTTIDIS RIMA**, the same opening as the glottis. The term *rima* particularly denotes its slit-like form.

**GLOTTIS**, from *γλωττις*, *the tongue*, is the opening through which the air passes to and from the lungs in respiration. In this passage the voice is formed. See *DEGLUTITION* and *LARYNX*.

Julius Pollux makes the glottis a joint or part of a flute, and Hefychius says that the glott were little tongues, acted upon by the breath of the player. This description of Hefychius seems to confirm the idea of the ancient nominal flutes being a kind of hautbois.

**GLOTTIS**, in *Ornithology*, a name given by many authors to a bird of the long-legged kind, approaching to the nature of our red-thank, but larger and longer legged, and generally known by the name *limosa*. See *SCOLOPAX Glottis*.

**GLOUCESTER**, in *Geography*, a city in Gloucestershire, England, is situated in a vale, on a gentle eminence, rising, on the east side, from the river Severn. This opulent city appears to have originated in a Roman station which was situated at King's Holm, near the north-eastern extremity of the present city. The Romans continued to occupy this spot till the distractions of their own empire occasioned them to quit the island. Its government then reverted to the British princes, under whose domination it continued till about the year 577, when, according to the Saxon Chronicle, it was surrendered to the West Saxons, and was reputed one of their principal cities: it was afterwards subjugated by the Mercians, who also obtained possession of the other parts of the county. Under the Saxons it acquired the appellation of *Gleau-cestre*. The strength and consequence of the city rendering it an object of frequent enterprise, its vicinity was several times the scene of action between the Britons and Saxons. By these conflicts, its buildings were nearly ruined; and the whole place might have sunk into complete decay, if Wolphere, son of king Penda, had not enlarged and adorned it, about the year 670. This restoration was so perfect, that Bede informs us, it was esteemed, about the commencement of the 8th century, as one of the noblest cities in the kingdom. Its early importance is evinced by its having been the residence of various Saxon monarchs; and hence it was denominated a royal city, as it is expressly termed in a grant made by king Edgar to the monks of Worcester, dated at Gloucester in the year 964. By this monarch a battle was fought here with the Danes, who had twice plundered the city in the preceding reign, and who again ravaged, and partly consumed it by fire, in that of his son Ethelred. Several of

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the Norman and English kings also occasionally resided and transacted public business in this city. A memorable era in the eventful history of Gloucester originated in a contest between Henry III. and the barons. That monarch, in 1263, appointed sir Maci de Besile, a French knight, sheriff of the county, and constable of the castle within the city. The preference thus given to a foreigner was violently resented by the indignant nobles, who immediately made choice of sir William Tracy, a native of the shire. He accordingly proceeded to exercise the duties of his office in holding a county court, but was suddenly interrupted by De Besile, who, entering with a party of the king's troops, seized the knight, and, with circumstances of peculiar cruelty, hurried him to the castle, where he was committed to close confinement. After this outrage, the barons departed sir Roger de Clifford, and sir John Giffard, with their dependants, to besiege the castle, for the double purposes of rescue and revenge; in a few days they obtained an entrance, and compelled De Besile to retire to the keep; he afterwards surrendered, and was sent as a prisoner to Erdesley castle, in the marches of Wales. In the year 1278 Edward I. assembled a parliament here, and several laws, connected with the statute of Quo Warranto, were enacted, and have, from that period, been known under the general appellation of the Statutes of Gloucester. In the course of the two next centuries, four parliaments were held here. The opposition of the Gloucesterians to the royal cause, during the reign of Charles I. is generally supposed to have operated fatally against his interest throughout the kingdom: so early as the year 1641, they declared for the parliament; raised a company of volunteers, which they added to their trained bands; procured cannon from London and Bristol, and repaired and strengthened the fortifications: though frequently besieged by the royalists, they successfully resisted every attack.

The ecclesiastical state of Gloucester, during the Roman and former part of the Saxon period of its history, is involved in much obscurity; but in the year 657, Edwy, king of Northumberland, having subdued Mercia, erected Litchfield into a bishop's see, and included Gloucestershire within its diocese. This bishopric was soon afterwards divided into the five smaller of Litchfield, Dorchester, Leicester, Hereford, and Worcester; to the last of which this district was annexed, and continued subject, till the reign of Henry VIII., who, by letters patent, dated September 3d, 1541, and afterwards confirmed by act of parliament, erected "the city of Gloucester, the county of that city, and all the county of Gloucester, into a bishopric, with a dean and chapter, by the name of the diocese of Gloucester; and ordained that such part of the then vill and county of Bristol, as formerly was in the diocese of Worcester, should be from thenceforward in the diocese of Gloucester for ever." The church appointed for the cathedral of the new see, was that belonging to the abbey, founded by Wolphere, first Christian king of Mercia, and Ethelred, his brother and successor, in the year 681. The New Minister, as it is termed in the records, was burnt, with the monastery, in 1087 or 1088; probably at the same time that the city was partly destroyed by the adherents of Robert, brother to William Rufus. Sudo, then abbot, began a new church in June, 1089; the first stone was laid by Robert, bishop of Hereford; and on the completion of the edifice, in the following year, it was dedicated to St. Peter, by the bishops of Worcester, Rochester, and Bangor. The abbey was again destroyed by fire in 1101 or 1102, but the church was saved. The present magnificent and interesting edifice has been erected at different periods, and consequently dis-

plays various specimens of ancient ecclesiastical architecture, in the Saxon, Norman, and English styles. The conversion of the abbey church into a cathedral was the chief cause of its preservation at the reformation; and, to the honour of the inhabitants of Gloucester, it became the object of their peculiar care during the civil wars, after which they obtained a grant of it from Oliver Cromwell. Hence the cathedral has been transferred to the present age, as nearly perfect in all its parts, with regard to its general construction, as it was left by the most favoured of its architects. The eras of erection of the principal parts are known; and hence the characteristic styles of each can be satisfactorily ascertained. The lower part of the nave, the chapels that surround the choir, and the crypt, are presumed to have belonged to the building erected by bishop Aldred, before 1089: the roof of the nave obtained its finishing and form in 1248. In 1310 the south aisle was begun; and part of the fourth transept was added in 1330. The building of the north transept and choir commenced about the same year; the latter was completed in 1457. Between the years 1351 and 1390, the elaborate cloisters were finished. The chapel of our Lady was built between the years 1457 and 1498; and the centre tower between 1457 and 1518. The interior of this splendid fabric consists of a nave, choir, side-aisles, and transepts, with a chapel of our Lady, and several smaller chapels or oratories. From the intersection of the nave and transepts rises a high tower, and on the south side is a handsome projecting porch. The roof is sustained on twenty-eight columns, which extend in two rows from the west end to the high altar, where the presbytery forms nearly a semi-circular sweep: the transepts have no isolated pillars. The chapel of our Lady is, as usual, attached to the presbytery; and there are chapels in the north-east and south-east angles of the transepts and choir, with two others projecting in the sweep between those and the chapel of our Lady. The outline, or ground plan of the cathedral, is probably the same at present as designed by bishop Aldred previous to the year 1089; and the crypt remains almost as perfect as the masons left it. The architecture of this subterraneous and gloomy place is massy, and suited to the immense weight resting on the arches, which are turned upon huge short pillars, and strengthened by groins of proportionate solidity. The nave is an interesting specimen of the style which continued to prevail for nearly two centuries after the Norman conquest. The arcade of ponderous round columns, and the rows of semi-circular arches above, impress the mind with ideas of the strength, solidity, and profound solemnity which must have accompanied its original state. The architecture of the west end is very different from the other parts of the nave; and the vault is covered by intersecting ribs, and ornamented key-stones; but the remainder is of the plainest description, with three ribs only to each pillar; yet the key-stones are carved. On each side are eight massive columns; the arches between them are bounded by large mouldings, carved into zig-zags, and other ornaments. Directly over each column, and at some distance, is a range of heads of various characters; some serene, and others terrific. These serve as brackets to clusters of short pillars, whose capitals display the most beautiful variety of foliage, on which zig-zag strings extend, serving as a base to other clustered pillars with equally elegant capitals: from those the ribs of the vault commence. The gallery windows, pierced through the wall above the arches, are divided by short thick pillars, and bounded by others, with zig-zag arches: a twisted string separates them from the clerestory windows. The north and south aisles of the nave are nearly in the style of the west end, with pointed windows, rich ramifications in the arches from the mullions, and fillet-

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ed vaults. The arch of entrance to the cloisters from the north aisle is most elaborately and exquisitely adorned by pillars, buttresses, niches, pinnacles, foliage, and pannels, and the singular ornament of twilled pinnacles under the arch. In the south aisle, nail-headed mouldings are introduced as embellishments on each side of the windows. An advanced gradation of style is exhibited in the interior of the south transept; but the most perfect and ornamental degree is displayed in the chapel of our Lady. The choir is divided from the nave by a screen, designed by Kent.

The dimensions of the cathedral and its several parts are as follow: entire length, inside, four hundred and twenty-three feet: length of the nave, one hundred and seventy-one feet; breadth, forty-one feet two inches; height, sixty-seven feet seven inches: breadth of the north aisle, twenty feet ten inches; height, forty feet six inches: breadth of the south aisle, twenty-two feet; height, forty feet: length of the south transept, sixty-six feet; breadth, forty-three feet six inches; height, eighty-six feet: length of the north transept, sixty-six feet; breadth, forty-three feet six inches; height, seventy-eight feet: length of the choir, one hundred and forty feet; breadth, thirty-four feet six inches; height, eighty-six feet: length of our Lady's chapel, ninety-two feet; breadth, twenty-four feet four inches; height, forty-six feet six inches: height of the tower, including the pinnacles, two hundred and twenty-five feet. The great cloister, which were completed by abbot Froucester, are the most elegant and perfect of the kind: the sides and roof are profusely embellished, and the windows are filled with mullions and tracery.

This cathedral contains several curious specimens of monumental sculpture. On the tomb of Edward II., which was erected by his son and successor, and exhibits great perfection of art, is a recumbent figure, in alabaster, of the deceased monarch, regally robed and crowned. Another monument, worthy of notice, is that to the memory of alderman Black-leach, and his wife, whose figures, in white marble, lie on a table tomb, dated 1639, and seem accurate copies of the portraits by Vandyck: they are evidently the work of a skilful artist. A third, deserving observation for its design and classic style, displays a group by Flaxman, erected to commemorate Mrs. Morley, who died at sea, in childbed: she is represented as rising from the waves with her infant in her arms, and conducted by two angels. Between the north aisle and the choir is a monument, erected by abbot Parker to perpetuate the memory of king Ofric: and in a chapel nearly opposite, is a figure, supposed to represent the unfortunate Robert Curteis, duke of Normandy, and eldest son of William the Conqueror.

The walls that surrounded Gloucester are mentioned in an ancient prophecy, attributed to Merlin; and tradition ascribes them to Cissa, the second king of the fourth Saxons. The Norman conqueror caused them to be strengthened and embattled: and they were again repaired in the nineteenth of Edward III. Leland describes Gloucester as "well-built of tymbre, and strongly defended with walles, where it is not fortified with the deepe streame of Severn water." The walls were completely demolished after the Restoration; and the only memorial of their former strength now remaining is the West Gate: this is embattled; and was erected in the time of Henry VIII. The castle, was probably built about the period of the Norman invasion; the remains were lately destroyed; and on its site was built the county gaol, which was completed in 1791: it consists of three divisions, respectively named the Penitentiary House, the Bridewell, and the Sheriff's Prison: these all have their dis-

tingt and appropriate regulations. The gaol contains 203 separate cells; 164 for sleep, and 39 for employment.

In this city and its suburbs were formerly eleven parochial churches: but only six are now standing; these of St. Michael, St. Mary de Crypt, St. Nicholas, St. Mary de Lode, St. John, and St. Aldate; the others having been either destroyed at the siege in 1643, or since taken down. In St. Michael's parish is a Blue Coat hospital, so called from the similarity of its regulations to those of Christ Church, London, founded and endowed in 1666 by sir Thomas Rich, bart. Among other benevolent establishments that confer honour on the inhabitants of Gloucester, may be mentioned the county infirmary, erected by voluntary contributions, and opened in the year 1755. Its annual receipts, arising from donations and the interest of funded property, amount to between two and three thousand pounds.

The principal trade of Gloucester results from the navigation of the Severn, from the hemp and flax-dressing business, and from the pin manufacture. The latter, which is the principal source of labour to the inhabitants, appears to have been introduced into this city by John Tilby, in the year 1626, and is now carried on to a far greater extent than at any other place in England; there being nine manufactories, which furnish employment to about 1500 persons. The pins conveyed annually to the metropolis, are said to amount to the value of 20,000*l.*; but the principal demand is from Spain and America. A bell-foundry has been established here above three hundred years. The clothing trade, formerly the chief support of the inhabitants, is now nearly lost: one fulling mill only remains.

Various and important privileges have been granted to Gloucester by several monarchs: it was erected into a borough by charter from king John; Henry II. granted the burgesses the same liberties and customs as had been enjoyed by the citizens of London; by the act 33 Hen. VIII., which established the bishopric of Gloucester, it is ordered that the town should thenceforth be termed a city. It is also privileged as a county within itself. The corporation, acting under a charter of Charles II., consists of a mayor, twelve aldermen, a high steward, recorder, town clerk, two sheriffs, common-council, &c. The title of mayor first occurs in the year 1483. The high stewards have generally been persons of great eminence. Two representatives to parliament are elected by the inhabitants and freemen; the number of voters is about 3,000; the earliest return was made in the twenty-third year of Edward I. The elections are carried on in an ancient structure, called the Booth-hall, which is also appropriated to the alizes and other county business. The public affairs of the city are transacted at the Tholfex, a building supposed to have derived its name from the toll formerly received in it by the lords of the manor. Very considerable improvements have been made, within the last seventy years, in the appearance and buildings of this city. It consists, principally, of four spacious streets, meeting each other at right angles, and taking their names from the situation of the gate which originally flood at the bottom of each, as East Gate street, West Gate street, North Gate street, and South Gate street. At the intersection of the streets, formerly flood a large and beautiful cross; but falling to decay, and impeding the passage of carriages, it was removed in 1750: its site still retains the name. The city is well paved and lighted: and its elevated situation, with a gradual descent on every side, greatly contributes to health and cleanliness. The markets had long been established by prescriptive right; but those now held, on Wednesdays and Saturdays, were chartered by Henry III. Three fairs are held annually and much frequented. The

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houses and population have varied considerably in different ages, according to the degree of security or danger which the inhabitants experienced: the progress has been several times interrupted by fires and civil commotions. Since the siege in 1643, the increase has been regular. On the last enumeration, under the act of 1801, the houses, in the city alone, amounted to 1368, the population to 7265: the inhabitants of the suburbs being 1500 more. Gloucester is situated 106 miles W. from London.

Among the more eminent natives of this city is Robert of Gloucester, who wrote a chronicle of Britain in verse, from the age of Brutus to his own time, the reign of Henry III.

On the north-west side of Gloucester is the celebrated isle of Abney, a small tract, formed by the separation of the stream of the Severn into two channels. This was the scene of a combat between Edmund Ironside and Canute the Dane, in the year 1016.

In the southern suburbs of Gloucester are the remains of Lanthony priory, founded in 1187. After the dissolution, the monastic buildings were converted into the offices of a farm. The only parts now left are a large barn, and the principal entrance, or gateway; on which are the arms, among others, of the Bohuns, earls of Hereford, who were great benefactors to the priory. Rudder's History, &c. of Gloucester. Beauties of England and Wales, vol. v.

*GLOUCESTER and Berkley Canal*, is the parliamentary name of a canal of very large dimensions, following the E. side of the Severn river between Berkley and Gloucester, of which Mr. Robert Mylne and Thomas Dadford were the engineers; the other particulars will be found in our article CANAL.

*GLOUCESTER, or Cape Ann*, a township of America, in Essex county, Massachusetts, whose east point forms the N. side of the bay of Massachusetts. It contains 5313 inhabitants, and is divided into five parishes, besides a society of Universalists. It is a port-town and a town of entry. The harbour is open and accessible to large ships, and it is one of the most considerable fishing towns in the commonwealth. At the harbour, properly so called, are fitted out annually from 60 to 70 bankers, and from Squam and Sandy bay, two small out-ports, the bay fishery is carried on with great spirit, and to a large amount. Thatcher's island, on which are two lights, lies close to the S.E. side of the township, which is itself joined to the continent by a bank of sand, that is rarely overflowed with the water. Here is a fine white sand, fit for the manufacture of glass. The harbour is defended by a battery and citadel erected in 1795:—16 miles N.E. by E. of Salem, and 34 N.E. of Boston.

*GLOUCESTER*, the N. westernmost township, and the largest, in Providence county, Rhode island, being 11½ miles square, containing 4009 inhabitants.

*GLOUCESTER*, the name of a county in New Jersey, bounded N. by Burlington county, S. by Salem, Cumberland, and Cape May counties, E. by the Atlantic ocean, and W. by Delaware river. Its length on the Delaware is about thirty miles, and on the sea it is about 22 miles. Great and Little Egg harbour rivers are both navigable for vessels of about 200 tons about 20 miles from their mouths. The streams which fall into Delaware river are navigable for small vessels, a few miles up from their mouths, and afford some shad, roach, herrings, and perch. Its adjacent islands are Red Bank, Pett, and Old Man's creek. The soil of the county is a mixture of sand and loam, and the tract bordering on the Delaware is in a high state of cultivation. The chief productions are beef, pork, fish,

hay, corn, lumber, butter, cheese, &c. It is divided into ten townships, viz. Woodbury, Waterford, Newtown, Gloucester township, Gloucester town, Deptford, Greenwich, Woolwich, Egg harbour, and Galloway. Mulicus river divides the county from Burlington, and is navigable 20 miles for vessels of 60 tons. Maurice river runs southerly about 40 miles through Cumberland county into Delaware bay, and is navigable for vessels of 100 tons 15 miles, and for shallops 10 miles further. It contains 16,115 inhabitants, of whom 61 are slaves. In this county are found quantities of bog-iron ore, which is manufactured into pig and bar iron, and hollow ware. Here is also a glass-house. The chief town is Woodbury, nine miles S. of Philadelphia.

*GLOUCESTER*, a small town in the above-mentioned county, on the E. side of Delaware river, three miles below Philadelphia.—Also, a port-town in Virginia, in the county of its own name, on a point of land on the N. side of York river, 17 miles distant from York town.

*GLOUCESTER*, a county in Virginia, fertile and well cultivated, bounded N. by Piankitank river, which separates it from Middlesex, E. by Matthews county and Chesapeake bay, N.W. by King and Queen, S. and S.W. by York river, which divides it from York county. It is about 55 miles long and 30 broad, and contains 3272 free inhabitants, and 4909 slaves. The low lands produce excellent barley, and Indian corn, the staple produce of the county.

*GLOUCESTER House*, a station belonging to the Hudson-bay company, situated in New South Wales, on the N. side of the waters which form a communication through a chain of small lakes, between Winnipeg lake and Albany river. Henley house lies N.E. of this, nearer the mouth of Albany river in James's bay. N. lat. 54°. W. long 87° 30'.

*GLOUCESTER*, a township in the county of Dundas in Upper Canada, which is the seventh in ascending the Ottawa river; E. of, and contiguous to, the river Rondeau.

*GLOUCESTER, Cape*, a cape on the S. coast of Terra del Fuego.—Also, a high promontory on the E. coast of New Holland. S. lat. 19° 59'. E. long. 148° 11'.—Also, a cape on the coast of New Britain. S. lat 5° 54'. E. long. 148° 15'.

*GLOUCESTER Island*, an island in the S. Pacific ocean, about six miles long, and from one to a quarter of a mile broad, discovered and so called by captain Wallis in 1767. It is surrounded by rocks, full of trees, and inhabited by persons who appeared armed with long pikes or poles, but destitute of canoes. S. lat 19° 11'. W. long. 146° 4'.

*GLOUCESTER, Duke of, Islands*, two islands in the S. Pacific ocean, discovered and so called by Captain Carteret in 1767, which were covered with trees, but appeared to be uninhabited. The southernmost of them was a slip of land in the form of a half-moon, low, flat, and sandy; the appearance of it was pleasant, but it had neither vegetables nor water; but it abounded with birds, so tame that they might be taken by the hand. The other island very much resembled this, and is distant from it about five or six leagues; they lie W.N.W. and E. S. E. of each other. One of them is in S. lat. 20° 38'. W. long. 145°: the other in S. lat. 20° 34'. W. long. 146° 15'; the variation 5° E. These islands are probably the land seen by Quiros, as the situation is nearly the same.

*GLOUCESTERSHIRE*, one of the western counties of England, is surrounded by Herefordshire, Oxfordshire, Berkshire, Wiltshire, Somersetshire, and Monmouthshire. It comprehends an area of nearly seventy miles in one direction, by forty in a transverse line. This district, during the Roman domination in Britain, was much occupied



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ped by the Romans. Mr. Fossbrooke (one of the historians of the county) observes, "from the ruins which have at various times been excavated, it is evident that this county, from Cirencester to Painfwick, Billey, Sapperton, Woodchester, Uley, Kingfeote, and other adjoining places, was much peopled with Romans, or Romanizing Britons; that Cirencester was the great metropolis, or resort of pleasure and amusement; while Gloucester, and the hills about the Severn, were the great military positions; the city, on account of the river, having peculiar advantages with respect to commerce." The principal Roman roads which passed through this county, were the Ikemild street, the Iriming or Erming street, the Foss-way, and the Via Julia. Under the dominion of the Saxons, Gloucestershire formed part of the Mercian kingdom, and Winchcombe and Kingstanley are mentioned as residences of the Anglo-Saxon monarchs. On the division of Mercia into five bishoprics, after the conversion of the Saxons, the greater part of this county was included under that named Wiccica, and from this appellation the Dobuni, the early inhabitants of this part of Britain, were afterwards termed Wiccii. Gloucestershire is separated into four divisions; these are subdivided into twenty-eight hundreds, containing 320 parishes, one city, and twenty-eight market towns. The number of houses, as returned under the population act, amounted to 37,276; of inhabitants, 187,164; of which 90,237 were males, and 96,927 females. The whole county, with the exception of the chapelries of Icomb, and Cowhonyborn, is included within the diocese of Gloucester; which comprehends one arch-deaconry, and ten deaneries. The number of representatives returned to parliament are eight; two for the shire, two for the city, two for Tewksbury, and two for Cirencester. The general aspect of Gloucestershire is greatly diversified; nature having divided it into three districts of very dissimilar character, respectively named the Hill, the Vale, and the Forest. The Hill district, including the Cotswolds, and the Stroudwater hills, may be regarded as a continuation of the central chain proceeding south from Derbyshire, and passing through this county with a smaller elevation into Wiltshire; there swelling into the Salisbury Downs, and afterwards running west towards the Land's End in Cornwall. The extent of the Cotswold hills, from Broadway hill to near Tetbury, is thirty miles; and from Birdlip hill to Burford, about twenty miles: the area they include is estimated, by Mr. Marshall, to contain nearly 200,000 acres. The surface is billowy; and the climate, considering the natural elevation of the land, unusually mild. The sides of the hills abound with springs; and almost every dip has its rill, and every valley its brook. The primary object of the Cotswold husbandry is sheep; these have been long famous; and it is a prevailing tradition, that the Spaniards originally procured their breed of fine woolled sheep from these hills, though this assertion is contradicted by several modern writers. The inclosures are chiefly stone walls, about four feet and a half high, exclusive of a coping of flat stones. The Vale district includes the entire tract bounded on the east by the Cotswold hills, and by the river Severn on the west; and is usually subdivided into the Vales of Evesham and Gloucester, and the Vale of Berkeley; the latter of which is separated from the former by a natural intersection, and is very different in produce and rural management. The Forest district is separated from the rest of the county by the river Severn; and is principally comprehended by the Forest of Dean, which was formerly of particular value, for the goodness and strength of its timber. Its oaks were so greatly renowned that Evelyn observes, that in Elizabeth's reign,

an ambassador was purposely sent from Spain to procure its destruction, either by negotiation or treachery. It abounds in beech; and the soil is considered as peculiarly favourable for the growth of the Stire apple. Its principal minerals are iron, ore, and coal: iron appears to have been wrought here even in the time of the Romans; and so early as the reign of Edward I. seventy-two furnaces for melting iron, are recorded to have been built here. In a survey made in the seventeenth year of Charles I. the forest is estimated as originally containing upwards of 43,000 acres, of which above 14,000 were woodland. Several thousand acres have, however, been granted away, by different sovereigns, and disafforested. The mines have distinct courts, and, like those of Derbyshire and Devonshire, are governed by their own customs.

The principal rivers connected with Gloucestershire, are the Severn, the Frome, the Wye, and the Isis or Thames. The canals that intersect the county are distinguished by the names of the Thames and Severn, the Stroudwater, the Berkeley, and the Hereford and Gloucester. The Severn, the second commercial river in England, renders essential service to a large portion of this county. It enters Gloucestershire near the ancient town of Tewksbury, where, uniting its waters with the Upper Avon, and pursuing a south-westerly course, it traverses a wide vale, which is rich in pasturage, and in some places abundantly wooded. About one mile above Gloucester, it divides into two streams: these again unite a little below the city, forming the tract of land called Alney island. In the course of its passage through the county, it receives the streams of the Upper Avon, the Chelt near Wainlode, the Leden near Over's-bridge, the Frome at Framilode, the Avon at Berkeley, and the Lower Avon below Bristol. The Wye separates part of this county from Monmouthshire and Herefordshire, and forms the grand natural western boundary to the forest of Dean, whose noble wooded eminences constitute many fine features on its meandering banks. The Thames, the most important of the British rivers, has its source in this county, at a place called the Thames-head, near the village of Cotes, about two miles south-west of Cirencester. Near this place the Thames and Severn canal emerges from under ground, and receives a considerable quantity of water, occasionally from this spring. The junction of the Thames and Severn was an object of favourite speculation with the London and Bristol merchants for many generations; but was not completed till near the close of the last century, an act for that purpose was obtained in 1783, and the design was brought to perfection in 1792, when the first vessel passed from the Severn into the Thames. This canal begins at Wallbridge, near Stroud, (at the place where the Stroud navigation ends,) and proceeds in a devious course through the county to Lechlade, where it joins the Thames. This course includes a distance of thirty miles, seven chains and a half. The water, in its progress from Stroud to Sapperton, (seven miles three furlongs), is raised by means of locks 241 feet 3 inches: between Sapperton and Lechlade, it falls 130 feet 6 inches. The Stroudwater canal encounters many obstacles; yet in defiance of all opposition, an act was obtained in 1775, under the operation of which it was finished.

The manufactures of Gloucestershire are numerous: clothing fluffs, blankets, rugs, carpets, stockings, &c. are made in different parts of the county. Bar iron, edge tool, wire, nails, and many other articles, are also manufactured in large quantities. Near Bristol are some extensive foundries, as well as different works for making brims and wire, vitriol, red-lead, ammoniac, &c. At Gloucester, vast quantities of pins are made: and at Frampton Cotterel is a considerable

considerable manufactory of felt-hats. Several authors have employed their pens in describing the topography and antiquities of this county: the principal of these are Sir Robert Atkins's "Ancient and present State of Gloucestershire," fol. 1712, second edit. 1768. Rudd's "New History of Gloucestershire," fol. 1779; Bigland's "Historical, Monumental, and Genealogical Collections," &c. folio, one volume and part of a second, 1791; Lysons's "Collection of Gloucestershire Antiquities," folio, 1801; Rudge's "History of the County of Gloucester, compressed and brought down to the Year 1823," 2 vols. 8vo. Fosbrooke and Yates's "History of Gloucestershire," 2 vols. 4to. 1805. "Beauties of England and Wales," vol. v. contains a concise and general account of the county.

GLOVE, CHIROTHECA, a habit or covering for the hand and wrist, used both for warmth, decency, and as a shelter from the weather.

Gloves are distinguished, with respect to commerce, into leather gloves, silk gloves, thread gloves, cotton gloves, worsted gloves, &c.

There are also gloves of velvet, satin, taffety, &c. Leather gloves are made of shaggy, kid, lamb, doe, elk, buff, &c. There are also perfumed gloves; washed, glazed, waxed gloves; and white, black, smuff-colour, &c. gloves; single, lined, topped, laced, fringed with gold, silver, silk, fur, &c.

It is a proverb for a glove to be good and well made, three kingdoms must contribute to it; Spain to dress the leather, France to cut it, and England to sew it. But, of late, the French seem to have appropriated the functions of the other two; the gloves of the French manufacture being now said to have the advantage, in point of dressing and sewing, as much as of cutting.

By 34 Geo. III. c. 10. the British duty on gloves and mittens imposed by 25 Geo. III. c. 55. is repealed, except the duty on licences; and by 36 Geo. III. c. 80. the said duty on licences is also repealed. By 6 Geo. III. c. 19. and 25 Geo. III. c. 55. foreign manufactured leather gloves or mitts shall not be imported, under the penalty of forfeiture; and the importer or seller incurs, besides forfeiture, a penalty of 200*l.* with double costs.

GLOVE, *to throw the*, was a practice or ceremony very usual among our forefathers, being the challenge whereby another was defied to single combat. It is still retained at the coronation of our kings, when the king's champion calls his glove in Westminster-hall.

Favyn supposes the custom to have arisen from the eastern nations, who, in all their sales and deliveries of lands, goods, &c. used to give the purchaser their glove by way of livery or investiture. To this effect he quotes Ruth iv. 7 where the Chaldee paraphrase calls glove what the common version renders by shoe. He adds, that the rabbins interpret by glove, that passage in the eighth Psalm, "In Idumeam extendam calcamentum meum, Over Edom will I cast out my shoe." Accordingly, among us, he who took up the glove, declared thereby his acceptance of the challenge; and as part of the ceremony, continues Favyn, took the glove off his own right hand, and cast it upon the ground, to be taken up by the challenger. This had the force of a mutual engagement on each side to meet at the time and place which should be appointed by the king, parliament, or judges.

The same author asserts, that the custom which obtained of blessing gloves, in the coronation of the kings of France, is a remain of the eastern practice of giving possession with the glove. Lib. xvi. p. 1017, &c.

The delivery of a glove was in frequent use formerly, as a symbol of investiture. See Du Cange, Gloss. Lat.

Gloves were also used to signify the steward's or bailiff's fee, or part of the price of the investiture or purchase-money of the land. "Si aliquam territorii partem venditari contigerit, domini venditiones habebunt; felicitet, tot denarios quot venditor inde labuerit solidos. Major vero terre illius pro *comitis* accipiet duos donarios." Where *comitis* signifies gloves; or, in French, *gants*.

Hence the common custom, in many bargains, of giving servants money for a pair of gloves.

Anciently it was prohibited the judges to wear gloves on the bench; and at present, in the stables of most princes, it is not safe going in without pulling off the gloves.

GLOVER, RICHARD, in *Biography*, was born at London in 1712. He received the elementary instructions in classical learning at Cheam, and exhibited a considerable taste for the classics, and an attachment to science. When he was only 16 years old, he wrote a copy of verses "To the memory of Sir Isaac Newton," which is prefixed to Dr. Pemberton's view of the Newtonian philosophy. He engaged in commercial pursuits, and became eminent in the mercantile world, to which he was introduced by his father. In 1737, he married a lady with a handsome fortune; and in the same year he published his epic poem of Leonidas. Glover had joined the opposition of the day, at the head of which was Frederic prince of Wales, and his poem, founded on the struggles of free Greece against Asiatic despotism, was calculated in a high degree to serve a generous cause. It abounds in noble sentiments, and is considerably varied by incident and description. Its plan is admirably adapted for poetical effect: it was received by Lyttleton and others with high applause, and very soon passed through three editions. "But it labours," says the critic, "under that want of interest which attends all modern epics, especially such as are built upon some of the subaltern events of ancient history; and its poetry is not of a character sufficiently elevated to engage the reader by the beauty of detached passages." The reputation which it first acquired soon subsided, and it now lives rather in memory than in the actual acquaintance of readers. He published in 1739, his poem, entitled "London, or the Progress of Commerce;" and the ballad of "Hoier's Ghost." Mr. Glover was not only a poet but an ardent politician, and was distinguished in various instances for his eloquence in the cause of freedom. His talents gained him great credit, and he was appointed by the merchants of London to conduct an application to parliament, complaining of the neglect with which their trade had been treated. The speech which he pronounced at the bar of the house of commons on this subject, in January 1742, was greatly admired, and was published. His celebrity as a public character, did not favour his progress in commerce; his affairs became embarrassed; he was, to use a modern fashionable phrase, obliged to suspend his payments, and at length retreated from active life, to practise economy in an obscure situation. The duchess of Marlborough bequeathed him, and Mallet, five hundred pounds each on condition of their joining to write the history of the great duke. Glover renounced the talk, and Mallet never executed it. He now wrote several pieces for the stage, which being successful to a considerable degree his circumstances became so much improved, that he ventured to return to public life, and sat as member for Weymouth, in the parliament of 1761. His commercial knowledge made him extremely useful on several important occasions. In the year 1775, he took an active part in an application to parliament on behalf of the West India merchants, and for his zeal and assiduity he was complimented with a valuable present of plate. He died in  
November

November 1735, and left behind him another poem, entitled the "Athenaid," relating, in thirty books, the wars between the Greeks and Persians. This was published in 1788, in three volumes 12mo., but it failed completely in attracting public attention.

GLOVER, in *Geography*, a township of America, in the state of Vermont and county of Orleans, N. E. of Craftsborough, adjoining. It has 35 inhabitants.

GLOVER'S Reef, rocks on the bay of Honduras. N. lat. 16°. W. long. 88° 20'.

GLOW-WORM, in *Entomology*. See CICINDELA. *Cantharis* and *Cicindela* have been often used, indiscriminately, for the glow-worm; but they form two distinct genera of the same order in the Linnæan system. See CANTHARIS. The glow-worm is often seen in the day time.

The male and female differ greatly in this species of insect. The male has wings, and is a small fly; the female has no wings, but is a large crawling worm.

The body of the male is oblong, and somewhat flattened; the wings are shorter than the body; the head is broad, dum, and flat; the eyes are large and black. This has no light issuing from it, and is not commonly supposed to be at all of kin to the glow-worm.

The female is what we expressly call by this name; this is a very slow-paced animal, without wings, and somewhat resembling a caterpillar; the head is small, flat, hard, and black, and sharp towards the mouth: it has short antennæ, and six moderately long legs; the body is flat, and is composed of twelve rings, whereas the body of the male consists only of five; it is of a dusky colour, with a streak of white down the back. It is often seen in the day-time, but it is not known except in the dark; at which time it is easily distinguished by the glowing light, or lambent flame, that is seen near the tail, issuing from the under part of the body.

The common glow-worm is frequently met with under our hedges, and, if carefully taken up, may be kept alive many days on fresh turfs of grass; all which time it will continue to shine in the dark.

The light of this little insect is so strong, that it will shew itself through several substances, in which the creature may be put up; a thin pill-box easily shews it through, and even though lined with paper, the light is not impeded in its passage by both. The creature is sluggish, and appears dead in the day-time, and its light is not distinguishable, even if carried into a darkened room, unless the creature be turned upon its back, and disturbed, so as to be put in motion, and then it is but very faint; after sun-set the light begins to return, and with it the life and motion of the animal. The motion and light of this creature seem, in some measure, to depend upon one another: it never shines but when the body is in some sort of action; and when it shines most, the body is extended to one-third more than its length in the day-time. In the time of brightest shining, it will sometimes on a sudden turn its body about, and the light will not be larger than the head of a pin; and, on being touched, it will then immediately extend itself, and the light will become as large and bright as ever. Phil. Transf. N. 71.

Two points seem to be agreed upon by naturalists, with regard to the light issuing from the tail of a glow-worm; first, that it is phosphoric, and secondly, that its use is to attract the male insect. Should the singularity, if any such there be, in the natural history of this animal, which should render a provision of this kind more necessary for the glow-worm, than for other insects, be a subject of inquiry; it may be observed that this singularity seems to be the

difference, which subsists between the male and the female, which difference is greater than what is found in any other species of animal whatever. The glow-worm, as we have observed, is a female caterpillar, the male of which is a fly; lively, comparatively small, dissimilar to the female in appearance, probably also as distinguished from her in habits, pursuits, and manners, as he is unlike in form and external constitution. Hence it appears, that the caterpillar cannot meet her companion in the air. The winged raver, therefore, did not this radiant torch direct the volatile mate to his sedentary female.

"In this example," says the ingenious author now cited, "we see the resources of art anticipated. One grand operation of chemistry is the making of phosphorus; and it was thought an ingenious device, to make phosphoric matches supply the place of lighted tapers. Now this very thing is done in the body of the glow-worm. The phosphorus is not only made, but kindled; and caused to emit a steady and genial beam, for the purpose which is here stated, and which I believe to be the true one." Paley's Natural Theology, p. 363.

*Glow-worm, Flying, cicindela volans.* In the warmer months of the year, this creature is sometimes caught in our houses flying to the flame of a candle, and when examined in the dark, it is found luminous at these times, though perhaps less, or not at all so, at others; which may be a reason of its not being known, though caught in the fields; and to this it may be owing, that many who have described it have thought it not a native of England. Without wings it is frequently enough found in form of the common glow-worm, and then always shines. Aldrovand has very well described the *cicindela volans*, and says, that it lays eggs which hatch into small worms, and that these after a time become flies, by the same sort of change which happens to caterpillars and other reptiles which become butterflies, and other species of winged insects. Moussett, and Thomas Bartholine, both describe the animal much as Aldrovand has done, but they allow the male only to have wings; but Julius Scaliger contradicts this, and says, that he has caught them both winged in the act of generation: this is a plain proof that both sexes are winged; yet it has not happened that both sexes have been acknowledged to be so, even by those who have quoted this passage. And Mr. Waller, who gives an account of them in the Philosophical Transactions, observed them in the same manner in the act of copulation both winged, and with no other difference between them but that the female was the larger of the two, which is the case in regard to many insects. Julius Scalig. Exerc. 191. Phil. Transf. N. 167, p. 841.

The male and female in this winged state both shine in hot weather, and their light is so vivid as to be easily seen even while there is a candle in the room; the vibrations of it are irregular and its colour greenish. The luminous parts are two small specks under the tail at the end, and the light continues in these some time after the tail is cut off, but then gradually goes out.

The parts of insects continue alive in some degree for a considerable time after they are cut off, and probably the light in the tail of this animal continues just as long as that sort of life remains in it. Moussett, cap. 15.

The use of this light seems to be to direct the animal in its course, and in the taking of its prey, and to this purpose it is admirably placed. The tail is easily bent under the belly, and then throws the light full upon any object about or under the head of the animal, and the eyes are placed not on the upper part but on the under side of the head; so that they have all

all the advantages of it, while the light in this part is not offensive to the eyes, as it naturally would have been if carried before the head. The creature can, upon occasion, cover his light, so as not to be known, or pursued by it, by its enemies. Thomas Barthol. de Luce Anim. lib. ii. cap. 12.

This insect is of the beetle kind, of a brown and dusky colour. It has hard case or shell wings, as the other beetles have, and when these are expanded, there appear a pair of very large membranous ones; its head is covered with a sort of shield or broad-brimmed hat: under this hat are placed the eyes, which are black and large, and are moveable, so that the creature can, upon occasion, thrust them forward: it has two hairy antennae, and its legs are like those of the common fly, hard, shelly, and hairy. Its eyes afford an elegant object for the microscope, being composed of an infinite number of lenses, as those of the libelle and other insects. Aldrovand. de Insect. lib. i. cap. 8.

GLOXINIA, in *Botany*, named by the late M. L'Heritier in honour of Dr. Benjamin Peter Gloxin, a native of Colmar, in whose inaugural dissertation, published at Strasburg in 1735, are given the characters of *Martynia* and some neighbouring genera, among which the plant now under our consideration is comprehended. The same work also contains the first description and figure of the *Salvia konnroides*, unnecessarily changed by L'Heritier afterwards to *S. formosa*; and one of *Cyperus aegyptiacus*, which proved the *Schoenus mucronatus* of Linnæus. L'Herit. Strep. Nov. 149. Ait. Hort. Kew. v. 2. 331. Willd. Sp. Pl. v. 3. 229. Mart. Mill. Dict. v. 2. Class and order, *Didymia Angiosperma*. Nat. Ord. *Personata*, Linn. *Campanulaceae*, Juss.? or rather a new order, distinguished by lateral, not marginal, receptacles of the seeds. *Juss.*

Gen. Ch. Cal. Perianth superior, of five oblong, spreading, nearly equal leaves. Cor. of one petal, obliquely bell-shaped; gibbous at the base; its border in five rounded obtuse lobes, the four uppermost recurved, the lower one prominent, concave and inflexed. Stam. Filaments four, much shorter than the corolla, with the rudiment of a fifth; inserted into the receptacle, connected with the base of the corolla, incurved, downy, converging laterally in the upper part, two of them rather the shortest; anthers ovate, peltate, two-celled, cohering together, their lobes diverging. Pist. Germen inferior, turbinate, furrowed; style cylindrical, as long as the stamens; stigma capitate. Peric. Capsule imperfectly two-celled, with two valves, and two lateral divided receptacles. Seeds numerous.

Eff. Ch. Calyx superior, of five leaves. Corolla bell-shaped, with an oblique irregular border. Filaments, with the rudiment of a fifth, inserted into the receptacle. Capsule with many seeds, inserted into lateral receptacles.

1. *G. maculata*. Curt. Mag. t. 1191. (*Martynia perennis*; Linn. Sp. Pl. 862. Hort. Cliff. t. 18. Ehret. Piet. t. 9. f. 2. Mart. Mill. Dict. v. 3.—Native of South America; the seeds having been sent from Carthage by Mr. Robert Millar, before 1739. It requires with us the constant heat of a bark stove, by means of which it flowers late in autumn. It is propagated abundantly by the little tuberous roots, which are perennial. The stem is herbaceous, simple, leafy, round, very smooth, spotted with purple. Leaves large, opposite, recurved, stalked, broad-ovate, acute, serrated, smooth and shining, pale at the back, with prominent veins. Flowers axillary from the diminished leaves, or bracteas, at the upper part of the stem, solitary, stalked, large, drooping, of a fine blue with a dark spot at the bottom within. Their scent is very peculiar, resembling mint, which no writer seems to have noticed.

GLUBOKAIA, in *Geography*, a town of Russia, in the government of Kolyvan; 72 miles E. of Semipolotnoi.

GLUCHOV, or GLUKHOR, a town and district of Novogorod Severskoi, situated on the river Yesna, falling into the Seim; 40 miles E.S.E. of Novogorod Severskoi.

GLUCK, le Chevalier CHRISTOPHER, in *Biography*, a musical composer of great fire and originality, who, during the last 30 or 40 years of the preceding century, acquired great renown, but chiefly in France, by a species of composition, congenial to the national taste, which Lulli and Rameau had formed, and in which the short and simple airs required no great abilities in the fingers; but the dramas being written in the language of the country, and the poet being regarded as a much more important personage than the composer of the music, the several characters required great actors rather than great singers.

This eminent composer was born in the Palatinate, of a poor family, about the year 1716. His father, during the infancy of his son, removed into Bohemia, where he died, leaving his offspring in early youth, without any provision, so that his education was totally neglected; but nature had given him an instinctive love for music, which is taught to all children, with reading and writing, in the Bohemian schools, whether of charity or superior foundations, in all the towns and villages; in churches and in the streets, men, women, and children sing in parts, and play upon some instrument, and often on many instruments. This was the case with the young Christopher, who travelled about from town to town, supporting himself by his talents till he had worked his way to Vienna, where he met with a nobleman who became his patron, took him into his service, carried him into Italy, where he procured him lessons in counterpoint, at Naples, by which he profited so well, that before he left Italy he composed several dramas for different theatres, which acquired him reputation sufficient to be recommended to Lord Middlesex as a composer to our lyric theatre in the Haymarket, then under his lordship's direction. But, unluckily, arriving in England in 1745, after his first opera of "Artamene" had been performed ten nights, in which the famous air "Rafferenza il mello ciglio," sung by Monticelli, was constantly encored, the rebellion broke out, and the great Opera-house was shut up, on account of the popular prejudice against the performers, who, being foreigners, were chiefly Roman Catholics. Nor was the Opera-house allowed to be opened again, till January 7th, 1746, when "la Caduta de' Giganti," set by Gluck, was performed before the duke of Cumberland, in compliment to whom the whole was written and composed. The singers were Monticelli, Jozzi, and Ciacchi; with signora Imer, Pompeati, afterwards better known by the name of madame Cornelia, and Frasi. The first woman, Imer, never surpassed mediocrity in voice, taste, or action; and the Pompeati, though nominally second woman, had such a masculine and violent manner of singing, that few female symptoms were perceptible. The new dances by Auretti, and the charming Violetta, afterwards Mrs. Garrick, were much more applauded than the songs, which, however, for the time, had considerable merit. The first air in G. minor is of an original cast, but monotonous. The second air has genius and design in it. Then a duet, in which he hazarded many new passages and effects. The following air, for Monticelli, is very original in symphony and accompaniments which a little disturbed the voice-part in performance, we well remember, and Monticelli called it *aria tedesca*. His contemporaries in Italy, at this time, seemed too much filed down; and he wanted the file, which, when used afterwards in that country, made him one of the greatest composers of his time. The next air printed, is in a very peculiar measure,

ture, and like no other that we recollect: it has great merit of novelty and accompaniment; the voice-part wants only a little more grace and quiet. The following song, set for Jozzi, a good musician with little voice, is full of new and ingenious passages and effects; we should like much to hear this air well performed at the opera; it is kept alive from beginning to end. Something might be expected from a young man able to produce this opera, imperfect as it was. It had, however, but five representations.

From London he returned to Italy, and composed several operas in the style of the times, such as that of Terradellas, Galuppi, and Jomelli; and we heard little of him till he enlisted with the Italian poet Calfabigi, with whom he joined in a conspiracy against the poetry and music of the melo-drama then in vogue in Italy and all over Europe.

It is extraordinary that Calfabigi, editor of the beautiful Paris edition of the works of Metastasio in 1755, in the preface to which there is the highest and seemingly most cordial praise of the works of the imperial laureate, should be the first, ten years after, to find them so defective; writing his "Orfeo" in a different style, and joining with Gluck in decrying the lyric style both of the music and poetry of the Italian opera.

In 1764, the year in which the late emperor Joseph was crowned king of the Romans, Gluck was the composer, and Guadagni the principal singer. It was in this year that a species of dramatic music, different from that which then reigned in Italy, was attempted by Gluck in his famous opera of "Orfeo," which, with Guadagni's admirable action, succeeded so well, that it was soon after attempted in other parts of Europe, particularly at Parma and Paris. This is not the place to discuss its merit; we shall here only observe, that the simplifying dramatic music in Gluck's manner, in favour of the poet, at the expence of the composer and singer, is certainly very rational, where an opera is performed in the language of the country, and the singers have no great abilities to display, as in France; but in England, where we have frequently singers of uncommon talents, and where so small a part of an opera audience understands Italian, by abridging the symphonies, and prohibiting divisions and final cadences, in favour of an unintelligible drama, we should lose more than we should gain.

After its success at Parma and Paris, "Orfeo" was exhibited at Bologna, Naples, and in 1770 in London; when the principal parts were filled by Guadagni and Grassi, afterwards Mrs. Bach.

The unity, simplicity, and new dramatic excellence, which at Vienna, and afterwards at Paris, rendered this drama so interesting as to make the audience think more of the poet than the composer, were greatly diminished here, by the heterogeneous mixture of music of other composers in a totally different style.

In 1769, Calfabigi and Gluck, encouraged by the success of "Orfeo," produced "Alceste," a second opera, on the reformed plan, at Vienna, which received even more applause than the first. In 1771, the same poet and musician brought a third opera, "Paride ed Helena," on the stage at Vienna, written and composed in the same new, or rather old, French style, with better music, in which Millico was the principal singer, and which afforded the audience such pleasure as seemed to have impressed the lovers of music in the imperial capital with a partiality for that species of dramatic music, which was not likely to be soon obliterated.

In 1772, Gluck set to music an opera taken from Racine's "Iphigenie," in which he so far accommodated himself to the national taste and style of France, as frequently to imi-

tate and adopt them. And as this opera was intended for Paris, his friends feared for its success, as there was frequently *melody*, and always *measure*, in his music, though set to *French words*, and for a *serious French opera*.

But the year 1774 was rendered a remarkable era in the annals of French music, by the arrival of the celebrated Gluck at Paris, whose operas, by his conforming to the *style* of the French language, and flattering the ancient national taste, were received with acclamation. He began his career in this capital by his celebrated opera of "Orpheus," of which the reputation was already established; and this was followed by "Iphigenie," taken from one of Racine's best tragedies, which had all the success that may be imagined from the force of his genius applied to a favourite drama, set in the style of their favourite composers, Lulli and Rameau.

In his opera of "Cythere Affligée," 1775, where more delicacy and tenderness, than force, were required in the composition, he was not so successful. Nor was his "Alceste," the year following, received with the same rapture as at Vienna. Indeed his "Armide," in 1777, did not quite fulfil the ideas of grace, tenderness, and pathos, which some of the scenes required, and auditors accustomed to Italian music expected; however, his operas were excellent preparations for a better style of composition than the French had been used to; as the recitative was more rapid and the airs more marked, than in Lulli and Rameau: there were likewise more energy, fire, and variety of movement, in his airs in general, and infinitely more force and effect in his expression of grief, fear, remorse, vengeance, and all the violent passions.

Gluck's music is so truly dramatic, that the airs and scenes, which have the greatest effect on the stage, are cold, or rude, in a concert. The situation, context, and interest, gradually excited in the audience, give them their force and energy.

Indeed, he seems so much the national musician of France, that since the best days of Rameau, no dramatic composer has excited so much enthusiasm, or had his pieces so frequently performed. It has been said in the "Journal de Paris," that each of his pieces had supported two or three hundred representations. The French, who feel very enthusiastically whatever music they like, heard with great rapture the operas of Gluck, which even the enemies of his *genre* allowed to have great merit of a certain kind; but though there is much real genius and intrinsic worth in the dramatic compositions of this master, the congeniality of his style with that of their old national favourites, Lulli and Rameau, was no small merit with the friends of that music. The almost universal cry at Paris was now, that he had recovered the dramatic music of the ancient Greeks; that there was no other worth hearing; that he was the only musician in Europe who knew how to express the passions; these and other encomiums preparatory to his apotheosis, were uttered and published in the journals and newspapers of Paris, accompanied with constant and contemptuous censures of Italian music, when Piccini arrived. This admirable composer, the delight and pride of Naples, as Gluck of Vienna, had no sooner erected his *quartier* in France, than all the friends of Italian music, of Rousseau's doctrines, and of the plan, if not the language, of Metastasio's dramas, enlisted in his service. A furious war broke out, all Paris was on the *qui vive*? No door was opened to a visitor, without this question being asked previous to his admission: "Monneur! estes vous Picciniste ou Gluckiste?" Their disputes, and these of mutual enmities, and rival animosities throughout the kingdom, seem to have soured and diminished the pleasure arising from music in proportion as the circle advanced to perfection. When every *note* of a singer in a vocal composition, is to be analysed and dissected during performance, all the *enthusiasm*

enthusiasm vanish, and the whole becomes a piece of cold mechanism. It is certainly necessary for professors to study cause and effect, and to make themselves well acquainted with the fundamental rules of their art; but we would advise true lovers of music to *listen* more than talk, and give way to their feelings, nor lose the pleasure which melody, harmony, and expression ought to give, in idle enquiries into the nature and accuracy of their auricular sensation.

The chevalier Gluck, after returning to Vienna from Paris, and being rendered incapable of writing by a paralytic stroke in 1784, only lingered in a debilitated state till the autumn of 1787, when he died at the age of seventy-three.

Gluck had great merit as a bold, daring, nervous composer; and as such, in his French operas, he was unrivalled. But he was not so universal as to be exclusively admired and praised at the expense of all other composers ancient and modern. His style was peculiarly convenient to France, where there were no good singers, and where no good singing was expected or understood by the public in general; and where the poetry was set up against music, without allowing equality, or even an opportunity of manifesting her most captivating vocal powers.

It is, however, allowed by an exclusive admirer of Gluck, in the Encyc. Meth., that "the Italians have the glory of having furnished examples of almost every kind of beauty of which music is susceptible, and of having disseminated their taste in every part of Europe;" but adds, that "France will owe to the celebrated Gluck the having first conceived the system of a music truly dramatic, and our theatre will furnish true models of it to other nations, and to posterity. Let us hasten to steal from the Italians and the Germans the glory of laying the true foundation of a musical system and of transforming the most amiable and touching of arts, into a science as interesting as it is fertile."

Gluck, in a moment of *franchise*, over a bottle, said "the French are a very good sort of people, who love music, and want *songs* in their operas; but they have no singers." And Sacchini, being asked how his operas were executed at Paris, said, "God forbid I should ever go to hear them performed!" And these are the people who are to furnish models of dramatic music to Italy, and to all the rest of Europe!

GLUCKSBURG, in *Geography*, a town of Denmark, with a fortress, in the duchy of Sleswick; nine miles E. of Flensburg.

GLUCKSTADT, a sea-port town of Germany, in the duchy of Holstein, belonging to Denmark, situated on the Elbe. This town is regular and well-built, and its market place commands the chief streets. Several canals run through it, and the principal one crosses near the market place, and is here connected with another, which divides the town into two nearly equal parts. On the land side it may be laid under water. Gluckstadt is the seat of the king's regency, and of the offices and courts connected with it. Here is also a grammar-school. The Calvinists are permitted to have a church, the Roman Catholics a chapel, and the Jews a synagogue. In 1738 a commercial college was instituted here by king Christian VI., as it was a place of some trade; and in 1750, king Frederic V. established an office for keeping the harbour, adjoining to which is a basin for the reception of vessels, in good condition. Gluckstadt was built in 1620 by permission of Christian IV. in a waste called the Wilderness, and in the patent granted to it, he ordered that it should be called Gluckstadt, or the Fortunate Town; he also conferred upon it many customs, rights and privileges, such as were enjoyed by the town of Wiler; and it was soon after invested with the Lubeck and Ham-

burgh rights. It is distant 28 miles N.W. from Hamburgh. N. lat. 53 51'. E. long. 9 20'.

GLUE, GLUTEN, a viscid, tenacious matter, serving as a cement to bind or connect divers things together.

There are divers kinds of glues made use of in the divers arts; as the common glue, glove glue, parchment glue: but the two last are more properly called *size*.

The common or strong glue is a commodity used by numerous kinds of artificers; as joiners, cabinet-makers, case-makers, hatters, book-binders, &c. and the consumption thereof is very considerable. The best is that made in England, in square pieces of a ruddy brown colour: Flanders glue, which is whitish and transparent, is held the next after the English. The most ordinary glue of France is black and opaque.

Glue is made of the skins of all kinds of beasts; as oxen, cows, calves, sheep, &c. The older the beast is, the better is the glue that is made of its hide. Indeed, it is rare they use whole skins for this purpose; these being capable of being applied to better purpose: but they make use of the shavings, parings, or scraps of the hides, and also horns; and sometimes they make it of the feet, sinews, nerves, &c. of beasts; and also of the pelts obtained from furriers.

That made of whole skins is the best, and that of sinews, &c. the worst: and hence, chiefly, arises the difference of glues, and the advantage of English and Flemish glues.

GLUE, *method of making*.—Mr. Clennell, in the Monthly Magazine for 1802, gives the following statement of the general mode of its manufacture. The materials above enumerated are "first digested in lime-water, to cleanse them from grease or dirt; they are then steeped in clean water with frequent stirring, and afterwards laid in a heap and the water pressed out. They are then boiled in a large brass cauldron with clean water, scumming off the dirt as it rises, and it is further cleansed by putting in, after the whole is dissolved, a little melted alum or lime finely powdered. The scumming is continued for some time, after which the mass is strained through baskets, and suffered to settle, that the remaining impurities may subside. It is then poured gradually into the kettle again, and further evaporated by boiling and scumming, till it becomes of a clear dark brownish colour. When it is thought to be strong enough, it is poured into frames or moulds about six feet long, one broad, and two deep, where it gradually hardens as it cools, and is cut out when cold by a spade into square cakes. Each of these is placed in a sort of wooden box open in three divisions to the back; in this the glue, while yet soft, is cut into three slices, by an instrument like a bow, with a brass wire for its string. The slices are then taken out into the open air, and dried on a kind of coarse net-work, fastened in moveable sheds four feet square, which are placed in rows in the glue maker's field. When perfectly dry and hard it is fit for sale. That is thought to be the best glue which swells considerably without melting by three or four days' immersion in cold water, and recovers its former dimensions and properties by drying. Glue that has got frost, or that looks thick and black, should be melted over again. To know good from bad glue, the purchaser should hold it between his eye and the light, and if it appears of a strong dark colour, and free from cloudy and black spots, the article is good." When glue is used by the carpenters, they break it and soak it for about 24 hours in cold water; and then melt the soaked pieces, causing it to simmer for a quarter of an hour over a slow fire and frequently stirring it. When cooled it becomes a firm gelly, which may be cut by any instrument. It is merely warmed for use, and in this state spread over the surface of the wood with a stiff brush. In an interval from



one to three days the pieces of wood will be so perfectly cemented, that boards, thus cohering, will as readily break in any part as separate at the junction. Glued boards will not set in a freezing temperature; the stiffening being occasioned by the evaporation of the superfluous matter of the glue, which is prevented by a considerable degree of cold.

GLUE, *Bees*. See WAX.

GLUE, *Fish*, is a sort of glue made of the nervous and mucilaginous parts of a large fish, found chiefly in the Russian seas.

These parts, being boiled, bear a near resemblance to that viscid matter found on the skins of cod-fish. When boiled to the consistence of a jelly, they spread it on a leaf of paper, and form it into cakes; in which state it is sent to us.

Fish-glue is of considerable use in medicine, and divers others arts; where it is better known under the name of isinglass and ichthyocolla. See ISINGLASS.

A strong and fine glue may be prepared with isinglass and spirit of wine thus: steep the isinglass for twenty-four hours in spirit of wine or common brandy. When the menstruum has opened and mollified the isinglass, they must be gently boiled together, and kept stirring till they appear well mixed, and till a drop thereof, suffered to cool, presently turns to a strong jelly. Then strain it, while hot, through a clean linen cloth, into a vessel to be kept close stopp'd. A gentle heat suffices to dissolve this glue into a transparent and almost colourless fluid, but very strong: so that pieces of wood, glued together with it, will separate elsewhere than in the parts joined. Boyle's Works abridg. vol. i. p. 130.

A strong compound glue may be made by infusing a mixture of common glue, in small pieces, with isinglass glue, in as much spirit of wine as will cover them, for about twenty-four hours: then melt the whole together, and add as much powdered chalk as will make it an opaque white.

A strong glue, that will resist moisture, may be obtained by dissolving gum sandarac and mastic, of each two ounces, in a pint of spirit of wine, and adding about an ounce of clear turpentine: then take equal parts of isinglass and parchment glue, and having pounded them into small pieces, pour the solution of the gums upon them, and melt the mixture in a covered vessel, with a heat less than that of boiling water: then strain the glue through a coarse linen cloth, and putting it again over the fire, add about an ounce of powdered glass.

Or, a strong glue, that will resist water, may be made by adding half a pound of common isinglass glue to two quarts of skimmed milk, and evaporating the mixture to a due consistence.

A glue, that will hold against fire and water, may be made by mixing a handful of quick-lime with four ounces of linseed oil, boiling them to a good thickness, and spreading the mixture on tin plates in the shade: it will thus become exceeding hard, but will easily be dissolved over a fire, and be fit for use. See CEMENT.

GLUMA, a *Husk*, in *Botany*, is the peculiar calyx of grasses and grass-like plants, and indeed their corolla, at least what is so termed by Linnæus, is of the same chaffy nature. Husks or Glumes are usually compressed, embracing each other at the base; more rarely they are depressed, flattened vertically, as in *Quaking-grass* or *Briza*. To the husk belongs the *arista* or *awe*, (see *ARISTA*), which is a bristle-shaped appendage, usually spiral, and possessing the properties of an hygrometer. It originates from the midrib or keel of the husk, and is either terminal or dorsal, being in the latter case placed sometimes very far down the back of the husk, as in many species of *Avena*, and in these instances

it belongs to the glumes that constitute the corolla, not the calyx. The *arista*, though so remarkable, is by no means always constant in the same species, though nearly invariably so in the flowers of the same individual plant.

Husks are mostly furnished with one central longitudinal rib, though the inner *glume* of the corolla in grasses have two nearly marginal ones. They have in most instances, besides the central rib, a greater or less number of lateral ones, and likewise longitudinal, of great use in distinguishing species of *Poa* and other difficult genera. Their margin is commonly thin and more or less membranous or scabrous. Some *glumes* always remain separate and distinct from the seed which they commonly enclose; others are closely incorporated with that part as it ripens, of which a curious example may be seen in *Briza*.

Some sorts of viviparous grasses exemplify the transformation of glumes into leaves in a remarkable manner, the awn remaining at the summit being perhaps the best indication of their original nature. See *Aira levisata*, *Engl. Bot. t. 2102*. The same metamorphosis of a petal into a leaf is indeed not rarely seen in a Tulip and other cultivated flowers. We have a wild specimen of a similar change in the *Arenaria alpina*, part of whose leafy involucre is become a perfect petal.

Glumes are, we believe, invariably permanent, never deciduous, till the seed ripens, when those of the corolla fall off along with the seed, serving the purpose of a *pericarpium*.

GLUMACEOUS FLOWERS, a term applied by some botanists to the flowers of the natural order of grasses, expressive of their chaffy nature.

GLUMMEN, in *Geography*, a town of Prussia, in the province of Natangen; 24 miles S. of Königsberg.

GLURANTZ, or GLURS, a town of the county of Tyrol, situated on the river Adige, built in 1362, and surrounded with walls in 1530. It was taken by the French in 1799; 36 miles W. of Brixen. N. lat. 46° 38'. E. long. 10° 26'.

GLÛS, in *Surgery*, a species of dysuria, attended with a copious quantity of mucus in the bladder. Hence, the malady has been named *dysuria mucosa*.

GLUT, among *Falconers*, the slimy substance that lies in a hawk's paunch.

GLUR, in *Rural Economy*, a term sometimes provincially applied to a large wooden wedge.

GLUTA, in *Botany*, so called by Linnæus, from the Latin word *glutus*, thrust close together, in allusion to the close application of the claws of the petals to the stalk which elevates the organs of fructification. Professor Martyn seems not to have been aware of this derivation. We are led to it by the repeated indication of the circumstance in Linnæus, and his use of the word *adglutinata*, even in the generic character, as well as in his subsequent observations. *Lin. Mant. 2. 160. Syst. Veg. Ed. 14. 821. Schreb. 126. Wildl. Sp. Pl. v. 1. 1120. Mart. Mill. Dict. v. 2. Juss. 427. Class and order, Pentandria Monogynia. (Linnæus refers it to Gynandria Pentandria) Nat. Ord. Capparidæ, Juss.?*

Gen. Ch. *Cal.* Perianth inferior, of one leaf, membranous, bell-shaped, obtuse at the base, cloven half way down into two lobes, deciduous. *Cor.* Petals five, equal, lanceolate, bluntish, somewhat oblique, four times the length of the calyx; their upper part spreading horizontally; their claws cohering round the stalk of the germen, and attached to it. *Stam.* Filaments five, bristle-shaped, rather shorter than the petals, inserted into the summit of the stalk of the germen; anthers versatile, rather oblong. *Fyl.* German.

obovate, standing on a cylindrical stalk, which is rather longer than the calyx; style thread-shaped, equal to the filaments; stigma simple, obtuse. *Peric.* and *Seeds* unknown.

*Eff. Ch.* Calyx bell-shaped, cloven, deciduous. Petals five; their claws cohering round the stalk of the germen. Stamens inserted into the top of that stalk, below the germen.

1. *G. Benghas.* Linn Mant. 2. 293. Native of Java, where it is called *Benghas*, and, if we mistake not, in the Malay language *Dodec*. This plant is unknown to all botanists except Linnæus, by whose herbarium alone it can be determined. His remarks have led the students of natural orders wide of the truth concerning it, for nothing can be more unlike *Passiflora*. To *Sterculia* it has some resemblance, and we have been much inclined to refer it to Juslieu's *Malvaceæ*, especially from its likeness in some respects to the *Affonia* of that author and of Cavanilles; but on examination this likeness proves fallacious. The most probable place for it is amongst or near the *Capparides*, but the fruit being unknown, leaves this matter in great doubt. After all, it may be thought to belong to some new order, which the students of natural arrangement are but too prone to make on every emergency, and the French in particular seem to think they shew their skill by their refinements on this head; whereas it is but an easier fault, though a more fatal one, than that of making too many genera, and ought to be watched with tenfold care.

The *Gluta Benghas* appears to be a *shrub* or *tree*, with slightly pubescent branches and buds. *Leaves* scattered, most numerous about the ends of the branches, from three to ten inches long, elliptic-lanceolate, bluntish, entire, tapering down at the base into a short footstalk; they are smooth on both sides, furnished with one rib and many transverse veins connected by innumerable reticulations. *Stipules* none. *Flowers* nearly the size of *Cl. matris Flammula*, or, as Linnæus says, of a cabbage blossom, in a corymbose panicle; whether terminal or axillary cannot be determined from the specimen, though he asserts the former. There is some appearance of a glandular depression at the back of the footstalk where it joins the leaf. S.

GLUTEA, ARTERIA, in *Anatomy*, a large artery distributed chiefly among the glutei muscles. See ARTERY.

GLUTEN, ANIMAL, in *Chemistry*. See ANIMAL FIBRE and BLOOD.

GLUTEN, *Vegetable*, a substance resembling the former, and found in several vegetables. (See *Vegetable FIBRE*.) Beccari first found that wheat-flour contained gluten in considerable quantity, and from this it is obtained by the following process. (Aikin's Dict) "Moisten any quantity of wheat-flour with a little water, and knead it with the hand into a tough ductile paste, then let a very slender stream of water keep dropping on the paste, while it is incessantly worked about with the hands, and the water will run off white and turbid, owing to the fecula or starch which it carries off. The paste in the mean time gradually becomes more of a grey and almost semi-transparent appearance; and when the water runs off quite clear, nothing is left in the hands but pure gluten. No other precaution is required in this preparation but that of not drenching the flour at first with water, but only using a very small quantity with much kneading, that the gluten may not be carried off along with the starch. Good wheat-flour will yield in this way about a fourth of its weight of gluten, and no other flour but that of wheat will yield it, except in a very small proportion, and hence probably the peculiar property of wheat-flour to make

bread without any other addition than a ferment." See BREAD.

Gluten is contained in small quantity in several vegetable juices and other parts, and may be separated from them. Bird-lime is supposed to be chiefly gluten, and the green fecula of plants abounds with it. See BIRD-LIME and FECULA.

GLUTEUS, in *Anatomy*, a name given to three large muscles, concerned in the motions of the pelvis and thigh, and distinguished from each other by the epithets magnus, medius, and minor. They occupy the outer and posterior part of the pelvis, from which they arise, and form the large fleshy prominences named the buttocks.

The *gluteus magnus*, or maximus, le grand fessier, ili-facro-femoral, is a very broad, thick, and bulky muscle, composed of large fasciculi loosely connected together, and separated to a considerable depth by adipose and cellular substance, of an irregularly quadrilateral figure, and situated obliquely at the outer and back part of the hip. The rounded swelling, which forms the outline of the buttock at its back part, and the projection of which hides the termination of the large intestine, is formed entirely by this muscle. Its external surface has the same degree of convexity as that of the buttock; the internal, which covers the tuberosity of the ischium, and the great trochanter, is proportionally concave. It arises, 1st. By short aponeurotic fibres, from about one inch of the posterior extremity of the crista ilii, where the bone extends beyond the sacrum, and from the neighbouring part of the immediately subjacent notch. At this origin an aponeurosis may be observed, continuous with that of the thigh, and of the vertebral muscles. 2dly. From the ligament connecting the posterior end of the iliac crista, to the back of the sacrum; and here it is continuous with the tendinous origin of the latissimus dorsi, longissimus dorsi, and sacro-lumbalis. 3dly. From the external margin of the sacrum, near its last foramen, from the tubercle at the side of the termination of the canal containing the medulla spinalis, and from the articulation between the sacrum and coccyx. 4thly. From the posterior surface of the coccyx. 5thly. From the surface of the great sacro-sciatic ligament. From these points the fibres all proceed obliquely downwards and outwards, nearly parallel to each other; the muscle is at first rather thinner and narrower, and grows broader and thicker as it proceeds. Its upper margin is closely attached to that part of the femoral fascia which covers the gluteus medius. The superior fibres, having turned over the great trochanter, join the upper part of the common tendon. The latter is most intimately connected to the fascia lata, so that, on the first inspection, the gluteus magnus appears to be inserted into this fascia, throughout the whole line of its front edge; we cannot, however, easily distinguish these parts by cutting through the muscle, and turning it aside. The common tendon receives the muscular fibres from above the trochanter, to below the quadratus femoris, where it begins to be attached to the bone. It is very firmly attached to the rough line, which commences at the root of the trochanter, and joins the linea aspera, occupying by its insertion a space of about three inches; it is situated here between the vastus externus and adductor magnus, to the former of which it is connected by tendinous and muscular fibres.

The exterior convex surface of this muscle is covered for a small space towards its upper part by a thin plate of the fascia lata, and is every where else immediately subjacent to the integuments. The inner surface covers the os innominatum, the sacrum and coccyx, the origin of the vertebral muscles, the gluteus medius, the pyramidales, the gemini, the obturator internus, the quadratus femoris, the tuberosity of the

the ischium, the origins of the semitendinosus and biceps, the adductor magnus, the sciatic nerve, and the great trochanter. A large synovial membrane, placed between this muscle and the last-named eminence, favours their reciprocal motions. The cavity does not in general contain much fluid; and it sometimes exhibits internal folds.

The *gluteus medius*, le moyen fessier, ilio-trochanterien, is a thick and broad muscle, flattened and triangular, partly covered by the preceding, but placed more at the side of the pelvis. It arises by very short aponeurotic fibres from the external surface of the os innominatum, immediately under the crista ilii, running forwards to the front as far as the anterior superior spine, and backwards to the sacro-sciatic notch: downwards it is bounded by the curved line, which marks the circumference of the gluteus minimus. Another origin of this muscle is from the fascia lata, where that aponeurosis is fixed to the crista ilii, and where it separates this muscle from the tensor vaginæ. From this double origin the fibres all take their course downwards, the anterior or shortest being at the same time directed obliquely backwards; the middle, which are longer, passing perpendicularly, and the posterior or longest, coming obliquely forwards. In this way they all converge to meet in a broad aponeurosis in the radiate fibres, beginning in the substance of the muscle, higher behind than before, and descending, as it receives the muscular fibres successively, to the great trochanter, to be fixed to the upper and anterior part of that eminence. Many of the anterior fibres are mixed with those of the gluteus minor; so that the two cannot be completely separated without dividing some of the muscular substance.

Its external surface is covered behind by the gluteus magnus, in front by the fascia lata. The inner surface covers the gluteus minor, the gluteal artery, and the surface of the bone. Its front edge is in contact with the tensor vaginæ; the posterior with the pyramidalis.

*Gluteus minor*, or minimus, le petit fessier, ilio-ischii-trochanterien. This is the smallest of the three glutei, and covers the os innominatum by its whole inner surface, being equally covered on the outside by the preceding muscle. It is thick and flattened, and has a triangular figure. It arises from the surface of the os innominatum by very short aponeurotic fibres; beginning at the anterior superior spine, and following a curved line, which extends from the latter process to the sacro-sciatic notch. From this line, of which the convexity is turned upwards, it covers the bone as far as the edge of the acetabulum. The muscular fibres all descend in a converging manner; the middle taking a perpendicular course, while the anterior are directed backwards, and the posterior forwards. They are all implanted in a broad radiated aponeurosis, which lies on the external surface of the muscle, except towards the front, where it is covered by a few fibres of the preceding muscle. This aponeurosis, as it descends, forms a strong tendon implanted immediately within the former, in the upper and anterior portion of the great trochanter. It has some connection to the capsular ligament of the hip; and a small synovial membrane is interposed between it and the trochanter. It is covered by the gluteus medius, and very slightly by the pyramidalis: it lies on the bone, on the capsular ligament of the hip, and the origin of the rectus cruris.

*Motions produced by the glutei.*—The muscles, which we have just described, move the thigh and pelvis reciprocally on each other. Their action on the pelvis may be observed both in standing and walking. When we support the trunk in the erect attitude on both feet, the glutei magni fix the pelvis firmly behind, and counteract that tendency which the body naturally has to fall forwards. Hence the

bulk and power of these very muscles in the human subject afford a clear proof that man was designed for the attitude on two feet; this gives to the human frame the buttocks, which are seen in no other animal, because man is the only biped among the mammalia. In the case now under consideration the glutei magni are assisted by the semi-tendinosi, semi-membranosi and bicipites; and antagonized by the psoæ and iliaci, which possess a force much inferior to that which opposes them behind, because they are aided by the weight of the trunk. When the pelvis has been bent forwards, the gluteus magnus will restore it; and if the circumstances admitted of this part being carried backwards, the same muscle would produce that motion. The other two glutei are not essentially concerned in the attitude of standing on both feet; but they are the principal agents in supporting and balancing the trunk on one foot, by inclining the pelvis over the head of that thigh bone on which the body rests, so that the centre of gravity of the trunk may be in a line drawn through that lower extremity. In this case their exertion counteracts the tendency of the trunk to fall on that side which is not supported. These muscles are further employed in the same kind of way in progression: the gluteus magnus balances the pelvis while one leg is carried before the other, and brought to the ground; and the two others support the trunk laterally, while the limb of the opposite side is in the air. In the attitude on one leg, the gluteus magnus can rotate the pelvis on the thigh-bone of its own side, so as to turn the symphysis pubis towards the opposite side. When the glutei move the thigh on the pelvis, the magnus restores the bone to its former position, where it had been previously bent: and, if the pelvis be carried forwards, it may move the former still farther in the direction of extension; the medius and semi-medius move the thigh away from the opposite limb. The *g. magnus* has the effect also of rotating the thigh outwards; while the anterior fibres of the two smaller muscles will rotate it inwards. The former is a tensor of the fascia lata.

GLUTTON, in *Zoology*. See *Ursus Gula*.

GLYCAS, MICHAEL, in *Biography*, a Greek historian, who is supposed to have flourished in the 12th or 13th century, though by some others he is referred to the 15th. He was a native of Byzantium, but spent a great part of his life in the island of Sicily. He is principally known by his "Annals," in four parts, containing the history of the world, from the creation to the birth of Christ, and that of the Byzantine emperors down to the death of Alexius Comnenus in 1118. interpersed with a number of theological, philosophical, and physical discussions. An edition of the "Annals" in Greek and Latin was given to the public by father Labbe, in 1660. The third part has been published separately by Meursius, with a version and scholia. Several letters of Glycas have been published in different collections. He was undoubtedly a very learned man, and the correspondence which he maintained with the literati of his age shew that he stood in very high reputation. Moreri.

GLYCERIA, in *Botany*, from γλυκίον, *sweet*, the seeds being eaten in Germany, and called Manna-seeds, on account of their sweet taste. Brown Prod. Nov. Holl. v. 1. 179.—Class and order, *Triartria Digynia*. Nat. Ord. *Gramina*. This new genus of grasses is founded by Mr. Brown on the *Elyca fluitans* of Linnæus, *Poa fluitans*, Sm. Fl. Brit. 95, with the following characters.

"*Glume* (Calyx) of two valves, containing many flowers. *Spikelet* cylindrical, awnless. *Perianth* (Corolla) beardless, its valves of equal length. *Scale* under the gemen solitary, fleshy, like a half shield. *Stigma*s doubly compound. *Seed* uncon-

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unconnected, oblong, with a furrow at one side. *Flowers* somewhat paniced.

We cannot but assent to the propriety of separating the grafts in question from *Poa* and *Egflucta*, as far as habit is concerned, but we are very certain that *Poa difflans*, *maritima procumbens*, and *rigida* of Fl. Brit. and *Cynofurus durus* of Linnæus cannot fail to go along with it, though we fear the characters given by the sagacious writer above quoted will not be found to hold good in all, if in any, of these. Perhaps the following definition of *Glyceria*, formed on simple and obvious Linnæan principles, may be unexceptionable, as embracing them all, and preserving an analogy with genera already established.

Calyx of two valves, containing many florets. Spikelet linear. Corolla of two oblong, obtuse, beardless valves. S.

GLYCINE, from *γλυκός*, *sweet*, the particular application of which is not very obvious, having originated merely from the sweet taste noticed by Cornuti in the leaves and tuberous roots of *G. Apios*. This indeed is the original, and perhaps the only true *Glyceria*, the numerous assemblage of species ranged under this genus, by recent writers, being very anomalous in fructification, especially those of New Holland, as will appear by Mr. Brown's definitions when the second part of his valuable work appears.—Linn. Gen. 373. Schreb. 495. Willd. Sp. Pl. v. 3. 1053. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 3. 34. Juss. 357. Lamarec Illustr. t. 629. Gærtn. t. 154. Class and order, *Diadelphica Decandria*. Nat. Ord. *Papilionacea*, Linn. *Leguminosæ*, Juss.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, compressed, two-lipped; upper lip notched, obtuse; lower longer, three-cleft, acute, its middle tooth longest. *Cor.* papilionaceous. Standard inversely heart-shaped, deflexed at the sides, gibbous at the back, emarginate at the top, and straight, till driven back by the keel. Wings small, oblong, ovate towards the extremity, bent downward. Keel linear, edeate, curved upwards, pressing the standard upward by its obtuse and dilated extremity. *Stam.* Filaments in two sets, (one simple, the other in nine divisions,) slightly separated at the top, revolute; anthers simple. *Pist.* Germen oblong; style cylindrical, rolled spirally; stigma obtuse. *Peric.* Legume oblong. *Seeds* kidney-shaped.

Ess. Ch. Calyx two-tipped. Stamens in distinct sets. Keel of the corolla forcing back the standard with its point.

Obs. *Glyceria Apios* and *frutescens* have a two-celled legume. *G. monoica* is a singular instance of a separation of sexes in flowers of this tribe.

This genus has accumulated from two species (*G. Apios* and *frutescens*) in the *Hortus Cliffortianus*, to eight in the first edition of *Species Plantarum*, nine in the second, fifteen in the fourteenth and last edition of *Systema Vegetabilium*, and finally to forty-four in Willdenow. These now form a very heterogeneous assemblage, and the New Holland ones constitute a distinct genus, the *Kennedia* of Venterat, distinguished by its spontaneously reflexed standard, and legume of many cells. The whole requires a thorough revision. Some are of opinion that *G. Apios* is generically distinct from all the others, and if so it would be most convenient, though this is one of the original species, to give it the generic name of *Apios*, retaining *Glyceria* for such more common and more numerous ones as may answer to the usual idea of the genus, an essential character being selected to combine them together.

GLYCINE, in *Gardening*, contains plants of the shrubby climbing kind; of which the species cultivated are the

shrubby glycine, or Carolina kidney-bean tree (*G. frutescens*); the two-spotted glycine (*G. bimaculata*); the reddish-flowered glycine (*G. rubicunda*); and the scarlet glycine (*G. coccinea*.)

*Method of Culture.*—In the first it may be effected by laying down the young branches in the early autumnal season. When well-rooted in the following autumn, they may be taken off and planted where they are to remain, or in nursery-rows, being watered when the weather is hot, and the roots protected in the winter by some sort of strawy material. They are found to succeed best in dry, warm, light sorts of ground.

And the other kinds may be raised by sowing the seeds when they can be obtained from abroad, or produced here in pots of light earth, in the early spring, being afterwards removed into other pots, and placed in the green-house, or Cape stove. It has been supposed by Mr. Curtis, that the two last may succeed in the open air, when planted out in warm sheltered situations, and protected during the winter season by some convenient matting or other means.

All the sorts are ornamental in their flowery climbing growth; the first in the open ground, and the latter in the green-house and stove collections.

GLYCINE, *Glycine*, Fr. in *Chemistry*. This earth was first discovered by M. Vauquelin in 1798. He detected it in the analysis of the beryl, undertaken at the desire of Haüy, who wished to have it ascertained by a strict chemical inquiry, whether the beryl and emerald were as similar in their composition as in the form of their crystallizations. The results of this inquiry were conformable to the expectations which gave rise to it, and the existence of a new earth in the beryl and emerald was confirmed by the experiments of Klaproth. Vauquelin, in the memoir in which he announced his discovery, called the new substance merely the earth of the beryl; afterwards, with his associates, Guyton, Fourcroy, and Chaptal, he determined on the name *glycine*, derived from the Greek *γλυκός*, *sweet*, because all the soluble salts of this earth have the property of producing a certain sweet astringent taste. When the name was selected, the character on which it was founded was peculiar; but though it ceased to be so on the discovery of yttria, yet as the name conveys no erroneous ideas of the body, to which it is applied, there is no impropriety in adhering to it: besides, the taste still serves as a physical characteristic; for, according to Vauquelin, the sweetness of the salts of glycine has a sensible difference from that of the salts of yttria, particularly of the sulphat.

Glycine, in its pure state, has not yet been discovered in nature: indeed, its occurrence in compound minerals is exceedingly rare, for it has only been found in the beryl, or ultramarine, the emerald and the gadolinite; and it enters but sparingly into the composition of these bodies; the beryl, in which it is most abundant, containing, according to the analysis of Vauquelin and Rose, no more than 14 per cent. From the analogy which exists between glycine and alumine, the former is very liable to be taken for the latter by chemists who do not pay particular attention to accuracy in their analytical inquiries. The first analyses of the emerald made by Klaproth and Vauquelin afford an instance of this kind: and M. Bindheim committed a similar error in his analysis of the beryl.

To obtain glycine in a state of chemical purity, finely powdered beryl is to be fused with three times its weight of caustic potash in a silver or platina crucible; the crucible is to be exposed for two hours to a strong red heat, and the mixture in fusion is to be frequently stirred with an iron rod, in order to keep the earth as much as possible suspended

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suspended and exposed by an extent of surface to the action of the alkali. If the treatment described is properly conducted, the fused mass, when softened with water, will be entirely dissolved by muriatic acid, assisted by a slight digesting heat: the muriatic solution thus procured must be evaporated to dryness. A large quantity of water will dissolve the soluble salts, and leave the principal part of the flux, which is to be separated and well washed on a filter. The filtered solution is to be precipitated by carbonate of potash. The precipitate, consisting principally of alumine and the earth in question, is to be dissolved in dilute sulphuric acid, and evaporated to the proper consistence to afford crystals of alum. If the precipitate produced by carbonate of potash has been well washed, it is necessary to add a little potash to the sulphuric solution. When the solution, on a second or third evaporation, and addition of potash, ceases to yield any more crystals of alum, the mother liquor is to be mixed with a solution of carbonate of ammonia, greatly exceeding the quantity necessary to saturate the acid, and to be transferred to a bottle having a ground stopple: the mixture is to be well agitated, and carbonate of ammonia is to be added till the precipitate which first appeared is re-dissolved, or no longer diminished by fresh portions of the carbonated alkali. The solution of the triple compound of glycine carbonic acid and ammonia is to be filtered in order to separate the small remaining quantity of alumine, and then boiled till the vapour ceases to change the colour of turmeric paper, or till it no longer has an ammoniacal smell; when all the carbonate of ammonia being driven off, the whole of the glycine will be found precipitated in the form of a white granular powder combined with carbonic acid. This powder is to be washed in a filter, till the water ceases to afford a precipitate with muriat of barytes and lime-water; it is then to be dried, and heated to redness: by this means, the water and carbonic acid, amounting to about half the weight of the whole, will be expelled, and the glycine, if it does not effervesce with acids, will be left in a perfectly pure state.

Glycine thus procured, is a snow-white powder, soft and somewhat unctuous between the fingers, very adhesive to the tongue, and destitute both of smell and taste. Its specific gravity is 2.976. It produces no change in the colour of vegetable blues. Neither oxygen nor nitrogen has any action on it, nor does it suffer any change by exposure to the atmosphere; as carbonic acid and moisture do not appear to be absorbed by it. It forms, with a small quantity of water, a slightly ductile paste, that possesses much less tenacity than that of alumine. Glycine has not yet been fused; it neither contracts nor hardens when heated, nor is it altered by exposure to the most intense fire. With borax it forms a white transparent glass, which does not become opaque on cooling. It refuses to combine directly with sulphur or phosphorus, but it appears from Fourcroy that a sulphuret may be formed by decomposing the sulphat of glycine by charcoal. Glycine is soluble in a saturated solution of sulphuretted hydrogen. A hydrosulphuret of this earth, it is likewise said, may be obtained by dissolving the sulphuret in water. In these properties it approaches the alkaline earths, and constitutes apparently the link of union between them and the clafs to which it belongs. It is dissolved by both the fixed alkalies in their liquid state, but in a less degree than alumine, and, like alumine, it is not taken up by ammonia. It is dissolved in a solution of carbonate of ammonia, as has already been mentioned. It very readily unites with acids. All its soluble salts produce, when first tasted, the sensation of sweetness, which gradually becomes astringent.

In relation to its affinity for acids, glycine appears to be intermediate between alumine and magnesia, for it decom-

poses only the salts of alumine, yttria, and zircon. And the order of its affinities is much the same, according to Fourcroy, as that of the other earths, sulphuric acid holding the first place, and nitric, muriatic, phosphoric, fluoric, boracic, and carbonic following. No experiments have been undertaken yet, to ascertain what combinations glycine is capable of forming with the earths and metallic oxyds.

Yttria and alumine are the only earths for which glycine is liable to be mistaken: the properties in which it resembles them are, rather unfortunately, of a most striking kind, but it has a number of other characters which are very distinct, and fully demonstrative of its peculiar nature. Glycine is similar to alumine, in being soluble in caustic solutions of the fixed alkalies, and in some of its physical qualities; but it differs from alumine in affording with acids sweet astringent salts; in not yielding alum with sulphuric acid and potash; in possessing a greater affinity for acids; in being entirely soluble in carbonate of ammonia; and lastly, in not being precipitated from its solutions by oxalat, tartrat, or prussiat of potash. It is to be distinguished from yttria, by its greater solubility in carbonate of ammonia, the latter requiring for its solution five times as much carbonated alkali as glycine, by its salts occasioning a precipitate, when added to any of the succinats, by the insolubility of yttria in fixed alkaline solutions, and by the precipitate which the salts of yttria afford with prussiat of potash.

Glycine was considered as a simple body till the important discoveries of Mr. Davy gave rise to new analogies; and though the compound nature of this earth is not yet fully demonstrated, yet there is every reason to believe that glycine, like the alkalies and alkaline earths, is a metallic oxyd: and the results of the experiments which Mr. Davy made on this body are explained best on such a supposition. This gentleman negatively electrified glycine, slightly moistened in contact with an amalgam of potassium, under naphtha, by a battery of 500 plates. After an hour the amalgam was thrown into water, and an alkaline solution was produced, which became cloudy when neutralized by acid, thus indicating the presence of the earth. Mr. Davy, following the nomenclature which he has adopted in respect to the new metals, has proposed glucium for the name of the metal of glycine, when its existence is no longer doubtful.

Carbonat of glycine, as well as all the other salts of this earth, has not yet been discovered ready formed in nature. It is procured by precipitating the sulphat, nitrat, or muriat of glycine, by either of the carbonated fixed alkalies. The precipitate, which is the salt sought after, being well washed and dried, appears in the form of soft white powder, having a greasy feel and great lightness. Carbonat of glycine is insoluble in water, and it is unaltered by exposure to the air. It is decomposed by all the acids, and by the action of a red heat: most probably all the alkaline earths deprive it of carbonic acid in the moist way. According to Klaproth it is composed of

Glycine	-	-	-	53
Carbonic acid and water	-	-	-	47
				100

*Phosphat of Glycine*.—Phosphat of soda, added to a neutral solution of nitrat of glycine, throws down this salt either in a white pulverulent form, or in a mucilaginous state. It is insoluble in water, insipid and uncrystallizable.

It is not decomposed by a violent heat, but it fuses into a white transparent glass, that does not become opaque on cooling. Phosphat of glycine is soluble in phosphoric acid. The sulphuric and nitric acids first dissolve this salt, and

and afterwards decompose it. Muriatic acid produces a similar effect, but in a less degree. It is likewise readily decomposed by the carbonated alkalies and by all the carbonated earths, except carbonat of magnesia. With the sulphat, nitrat, and muriat of alumine, it suffers decomposition, a mutual exchange of acids taking place between the two earths.

*Sulphat of Glycine.*—Glycine, both in its pure and carbonated state, dissolves very readily in dilute sulphuric acid. The solution by spontaneous evaporation affords octahedral crystals, composed of two oblique four-sided pyramids joined base to base, with their edges and solid angles truncated. It also, but with difficulty, yields when evaporated on a sand bath small needle-form crystals. The solution, when evaporated nearly to dryness, assumes a syrupy consistence. Sulphat of glycine, has a remarkable sweet and allringent taste. It is very soluble in water. Heated, it intumescs, suffers the watery fusion, and becomes pulverulent from the dissipation of its water. It is completely decomposed by a strong red heat, the acid being expelled and the earth left in its pure state. It has been already observed that sulphat of glycine is converted, when heated with charcoal, into a sulphuret; but this sulphuret, according to Fourcroy, does not become a pyrophorus, like alum thus treated, though sulphat of potash be present. A solution of nut-galls, added to this salt dissolved in water, produces immediately a white precipitate. Previous to the knowledge of this fact, such a property was conceived to be peculiar to metallic salts.

Sulphat of glycine, slowly evaporated with a small quantity of sulphat of potash, forms minute crystalline grains, which dissolve with ease in seven or eight times their weight of cold water. Glycine, added to a solution of alum, precipitates the alumine, and most probably produces a compound, similar to the preceding one. Sulphat of glycine is decomposed by all the alkalies and earths, excepting alumine, yttria, zircon, and silic.

*Nitrat of glycine* is procured by saturating nitric acid with glycine. The solution of this salt does not afford crystals by evaporation, but produces a ductile and adhesive mass, which, when further dried, falls into powder. It is very soluble in water and deliquescent in the air. It attracts moisture so strongly, that it might, if easily procured, be advantageously employed for absorbing the hygrometrical water of gases. Its taste is saccharine and astringent. Tincture of galls dropt into a solution of this salt produces a yellowish brown precipitate. Nitrat of glycine fuses at a low heat, but if the heat is increased, the acid is expelled. It is decomposed in the moist way by sulphuric acid, and by the same alkalies and earths as the sulphat. The proportions of its component parts are not known; but Vauquelin has observed that a given quantity of nitric acid requires rather more glycine than alumine for its complete saturation; yet the former earth, though in combination with nitric acid more soluble than the latter, decomposes, with the assistance of heat, nitrat of alumine, precipitating the alumine, and forming nitrat of glycine.

*Muriat of glycine* is procured by dissolving glycine in muriatic acid. It is in some respects similar to the nitrat, but differs in its solution, affording by careful management small crystals, the form of which, on account of their size, have not yet been determined; and in not being subject to deliquesce on exposure to the atmosphere. Its taste is similar. A solution of this salt in dilute alcohol is said to be an agreeable sweet liquid. When distilled *per se*, the acid flies off, and leaves the earth in a state of purity. It is also decomposed when heated with phosphoric acid. The

same effect is produced by sulphuric and nitric acids, and by the alkalies, and all the earths that decompose the nitrat.

*Acetat of glycine*, which is prepared by dissolving the earth in acetic acid, has not yet been procured in a crystalline form. Its solution, when evaporated, acquires a glutinous consistence, and the salt becomes brittle as it slowly dries.

*Succinat of Glycine.*—Any of the fuccinats added to the nitrat, muriat, or sulphat of glycine, precipitate the salt in question. Its properties have not yet been enquired into.

We are indebted for the imperfect knowledge we have of the combinations of glycine, with the several acids above-mentioned, principally to the celebrated discoverer of this earth. Glycine, in no form as yet, has been usefully employed; yet Vauquelin conceives that the earth itself and some of its salts, when they can be procured with facility, may admit of such an application in chemistry, in medicine, and the arts. Its marked attraction for animal and vegetable colouring substances induced him to think that there was a probability of its being serviceable as a mordant; and the peculiar taste of some of its salts gave rise to the hope that these combinations might produce salutary effects on the animal system. If his expectations should be realized, we must agree with Vauquelin, that these salts will be some of the most agreeable medicines that exist. *Ann. de Chem.* vol. xxvi. 155. xlii. 277. *Fourcroy Connaissance Chem.* vols. ii. iii. *Aikin's Chem. Dict.* vol. ii. *Philosoph. Transf.* part. ii. 1808. p. 352.

GLYCONIAN, GLYCONIUS, in the Greek and Latin poetry.

A Glyconian verse is that consisting of two feet and a syllable; at least this is Scaliger's opinion: who adds, that the Glyconian verse was also called the Euripidean verse. See VERSE.

Others hold, that the Glyconian verse consisted of three feet, a spondee and two dactyls; or rather a spondee, choriambus, and an iambus or a pyrrhic: which opinion is the most followed.

"Sic te diva potens Cyprî," is a Glyconian verse.

GLYCYRRHIZA, in *Botany*, Liquorice, γλυκύριζα of Dioscorides, who describes the plant very faithfully and accurately; but it is remarkable that he says the flower is like a hyacinth, which can allude to the colour only, whether his γλυκύριζα be the *Delphinium* or *Hyacinthus* of modern botanists. The word is composed of γλυκύς, *sweet*, and ῥίζα, *a root*; and the name in apothecaries' Latin, *liquiritia*, as well as the English one, liquorice, the French *reglisse*, the Italian *regalizza*, &c. with all their corruptions, originate from it.—*Linn. Gen.* 380. *Schreb.* 502. *Willd. Sp. Pl.* v. 3. 1143. *Mart. Mill. Dict.* v. 2. *Ait. Hort. Kew.* v. 3. 56. *Juss.* 359. *Tourn.* t. 210. *Lamarek. Illustr.* t. 625. *Gærtn.* t. 148.—*Class* and order, *Diadelphia Decandria*. *Nat. Ord.* *Papilionacea*, *Linn. Leguminosa*, *Juss.*

*Gen. Ch.* *Cal.* Perianth inferior, of one leaf, tubular, two-lipped, permanent; upper lip in three deep segments, of which the lateral ones are linear, the central one broadest and cloven; lower perfectly simple, linear. *Cor.* papilionaceous. Standard ovato-lanceolate, straight, longest. *Wings* oblong, very like the keel, but rather larger. Keel of two petals, acute, its claw the length of the calyx. *Stam.* Filaments in two sets, (one simple, the other in nine divisions,) straight; anthers simple, roundish. *Pist.* Germen shorter than the calyx; style awl-shaped, as long as the stamens; stigma obtuse, ascending. *Peric.* Legume ovate or oblong, compressed, acute, of one cell. *Seeds* very few, kidney-shaped. Eff.



# GLYCYRRHIZA.

Eff. Ch. Calyx with two lips; the upper three-cleft; lower simple. Stamens in distinct sets. Legume ovate, compressed, of one cell. Seeds one or two.

1. *G. cebinata*. Linn. Sp. Pl. 1046. Jacq. Hort. Vind. v. 1. t. 95. (Dulcis radix; Matth. Valgr. v. 2. 16. Camer. Epit. 423.)—"Legumes prickly. Flowers capitate. Stipulas lanceolate. Leaflets smooth; the terminal one nearly sessile."—Native of Italy, as well as of Tartary and the confines of China; also abundantly, according to Dr Silthorp, on the sandy shores of Crete, Samos, and other Greek islands, where it still retains its ancient name unchanged. The long pliant perennial roots, deeply descending into the ground in a favourable soil, are cultivated for their sweet taste and pectoral virtues, and are sufficiently well known. The stems are two or three feet high, nearly simple, leafy, round and striated. Leaves of several pair of equal, elliptical, entire, acute leaflets, the odd one on a little stalk only like the rest, not on an elongation of the main footstalk. Stipulas lanceolate, acute. Flowers several, in axillary, solitary, stalked heads; their colour a dull purple. Legumes clothed, in their upper part especially, with numerous long rigid prickles, resembling the fruit of *Xanthium strumarium*. Dioscorides compares them to that of the Plane-tree. The whole herb is destitute of pubescence, but somewhat clammy to the touch.

2. *G. fistida*. Desfont. Atlant. v. 2. 170. t. 199.—Legumes prickly. Flowers spiked. Stipulas lanceolate. Leaflets fealy beneath; the terminal one nearly sessile.—Found by Desfontaines on mount Atlas, and in cultivated fields near Mayane in Africa. We have it from Aleassar. Whole plant extremely fetid. Leaves much like the last in size and shape, but the flowers are pale yellow, in long spikes. Legumes crowned with the permanent style, which is longer in this than in the former. The stem, as well as both sides of the leaves, is besprinkled with minute scales.

3. *G. glandulifera* Waldst. and Kitzeb. Hungar. v. 1. 20. t. 21. Willd. Sp. Pl. v. 3. 1144.—Legumes clothed with glandular bristles. Flowers spiked. Stipulas obsolete. Leaflets emarginate, glutinous and downy beneath.—Native of Hungary. Flowers violet-coloured.

4. *G. glabra*. Linn. Sp. Pl. 1046. Woodv. Med. Bot. t. 167. (*G. vulgaris*; Dod. Pempt. 341. Ger. em. 1302.)—Legumes smooth. Flowers spiked. Stipulas scarcely discernible. Leaflets blunt; the terminal one on a long stalk.—Native of the south of Europe. Most commonly cultivated with us. The leaflets are large, glutinous beneath. Flowers pale purple, in long-stalked axillary spikes. Legumes oblong, smooth. We have a specimen of this species gathered in Circassia, by the celebrated traveller Dr. Clarke of Cambridge.

5. *G. asperina*. Linn. Suppl. 330. Pallas. Reis. v. 3. t. G. g. 1. 1, 2. (*G. hispida*; ibid. 754.)—Legumes smooth, beaded. Flowers spiked. Stipulas lanceolate. Leaflets roundish, prickly beneath. Stem and footstalks prickly.—Found by professor Pallas "in sandy ground between the river Volga and the Tamas." Pallas MSS. The root is extremely sweet, especially in the spring. Stems usually two, rarely three, ascending, a span high, nearly simple, leafy, rough with numerous little rigid prominent prickles, as are the footstalks, and backs of the leaflets. The latter are roundish or obovate, obtuse with a little point, smooth and veiny above. Flowers longish, pale violet, with whitish wings and keel, in one or two thick spikes about the top of each stem. The legumes are drawn by Pallas above an inch long, recurved, of a necklace-like form, and smooth, containing many seeds. The calyx is

oblong, purplish, rather hairy. It has the habit of a *Glycyrrhiza*, flowers of an *Astragalus*, and fruit apparently of a *Coronilla*; nor does the calyx answer to the generic character, being five-cleft.

6. *G. hispida*. Linn. Sp. Pl. 1046. (*G. orientalis*, *Aliquis* *hispidissima*; Tournef. Cor. 26.)—"Legumes hairy. Leaflets oblong-lanceolate, the terminal one on a long stalk. Flowers spiked."—Found by Tournefort in the Levant. Root perennial. Of this we have seen neither a specimen, figure, nor any further description.

GLYCYRRHIZA, in *Gordalium*, furnishes a plant of the herbaceous perennial kind, the common liquorice (*G. glabra*).

It is a plant which has the roots running very deep into the ground, and creeping to a considerable distance, especially where they stand long on a row.

*Method of Culture*.—A light sandy soil is the most adapted to the growth of this sort of crop, as its goodness consists in the length of the roots. The ground in which it is intended to be planted should be well dug, and dunged the year before planting, that it may have become perfectly mellow, and the dung well rotted and mixed with the earth, otherwise it will be apt to stop the roots from running down, and being properly supported; and immediately before planting it should be well dug again to the depth of three spades, and be laid very light and open.

When the land is thus prepared, fresh plants taken from the sides or heads of the old roots should be provided, care being taken that they have each a good bud or eye, being about ten inches long and perfectly sound.

The operation of planting them should be performed about the middle of March, which is done in this manner: a line is first set across the ground, then, with a long dibble made on purpose, the shoots or cuttings are put in, so that the whole plants may be set into the ground, with the heads about an inch under the surface, in a straight line about a foot asunder in the rows, and a foot and a half or two feet row from row.

When the whole spot of ground has been thus planted, a thin crop of onions may be sown over the land. These must be kept perfectly clean by the hoe, care being taken not to cut off the top shoots of the liquorice plants, as it would greatly injure them. All the onions which grow near the heads of the liquorice should also be removed. In October, the shoots of the liquorice should be removed, and a little very rotten dung spread upon the surface.

In the following spring, about March, the ground should be slightly dug between the rows of liquorice, burying the remaining part of the dung, being very careful not to cut the roots.

During the summer they must be kept quite clean by occasional hoeing. The same operations must be annually performed, so as to keep the ground and plants in perfect order.

These plants must remain three years from the time of planting, when they will be fit to take up for use, which should be done when the stalks are perfectly decayed; as, when taken up too soon, the roots shrink greatly, and lose in weight.

In taking up the roots the ground is trenched over, row after row, to the full depth, and the young shoots taken from the old roots cut into sets for new plantations; which should be made annually, in order to keep a constant succession of roots fit for being taken up.

The great art in this culture is to have the earth well trenched to a proper depth, to have good sets, and to keep

the ground afterwards quite clean by hoeing and other proper means.

The liquorice is a native of the south of Europe, but it has been cultivated in Britain ever since the time of Turner. (See Tourn. Herb. p. 2. fol. 12. published in 1562.) The chief places in which it has been long propagated for sale are, Pontefract, in Yorkshire; Worktop, in Nottinghamshire; and Godalming, in Surry; but it is now planted by many gardeners in the vicinity of London, who supply the metropolis with the roots.

**GLYCYRRHIZA**, in the *Materia Medica*. The root of the common liquorice, boiled slightly in a little water, gives out nearly all its sweetness. The decoction, pressed through a strainer, and inspissated with a gentle heat, till it will no longer stick to the fingers, affords a better extract than that brought from abroad, and particularly from Spain, whence our shops are chiefly supplied with it, and its quantity amounts to near half the weight of the root. The extract that is prepared here, is made by macerating, for four hours, liquorice root sliced, a pound, in a gallon of boiling water; then boiling down to four pints, straining the hot liquor, and evaporating it to a proper consistence. A purer extract may be made by a repetition of the processes of solution and evaporation; and it is kept in the shops under the name of "refined liquorice." Rectified spirit takes up the sweet matter of the liquorice equally with water; and as it dissolves much less of the insipid mucilaginous substance of the root, the spirituous tinctures and extracts are proportionably sweeter than the watery. This root contains a great quantity of saccharine matter, less disposed to run into fermentation than that of other vegetables, which is joined with some proportion of mucilage, and hence has a viscid sweet taste. From the time of Theophrastus it has been a received opinion that it very powerfully extinguishes thirst; accordingly it was named *αδύλα*, and the root directed to be chewed in dropsies and other disorders where great thirst prevailed. If this fact be true, it is the more remarkable, as sweet substances in general have a contrary effect. Accordingly Dr. Cullen observes, that the sweet of liquorice, separated from the root, does not quench thirst more than other sweets; and he ascribes the error respecting it to this circumstance, that if a piece of the root is chewed till the whole of the sweetness is extracted, farther chewing brings out the acrid and bitterish matter, which stimulates the mouth and fauces, so as to produce an excretion of fluid, and thereby takes off the thirst which the sweetness had produced. Liquorice is in common use as a pectoral or emollient in catarrhal defluxions on the breast, coughs, hoarsenesses, &c. Infusions or extracts from it afford likewise very commodious vehicles for the exhibition of other medicines. Lewis's M.M. Cullen M.M. Woodv. Med. Bot.

**GLYN**, in *Geography*, a county in the lower district of Georgia, in the United States, bounded E. by the ocean, N. by Alatanaha river, which separates it from Liberty county, and S. by Camden county. It contains 1374 inhabitants, including 1092 slaves. Its chief town is Brunswick.

**GLYPH**, in *Architecture or Sculpture*, is any canal or cavity used as an ornament.

The Greek word is *μαρμα*, which literally signifies *graving, niching*.

*Fædis* is properly a notch or indenture made in graving; or, more properly, it is the notch in the end of an arrow, in which the string goes.

**GLYPTIC ART**, the art of engraving precious stones. See **GEMS**.

**GLYSTER**. See **CLYSTER**.

**GMELIN**, JOHN GEORGE, in *Biography*, a physician and eminent botanist, was born at Tubingen on the 12th of August, 1709. He was distinguished by his diligence and early attainments at school, and at the age of fourteen was deemed ready for entrance upon the academical studies of his native place. In 1727, he took the degree of doctor of physic, and went to Peterburgh, whither some of his teachers had been invited. Here he gained many favours from Blumentook, the director of the academy, and was so highly esteemed, that, in 1729, he was elected one of the members of the academy, and in 1731 was appointed professor of chemistry and natural history. In 1733, he was selected for the department of natural history, in a commission formed by the Russian government, for the purpose of exploring the boundaries of Siberia; and set out on the 19th of August, with G. F. Muller, and Louis de l'Isle de la Croycere, and a party of twenty-eight persons, consisting of draughtsmen, miners, hunters, land surveyors, and twelve soldiers, with a serjeant and drummer. In the month of February, 1743, Gmelin returned safe to Peterburgh, after having employed nine years and a half in this long and dangerous journey, which proved highly interesting to the sciences, and he resumed the offices which he had before filled. In the year 1749, he entered upon a new professorship, to which he had been appointed, on the death of Bachmeister, while on a visit to Tubingen. He died of a fever in May, 1755, in the forty-sixth year of his age. The works, which were the result of his travels through Siberia, obtained for him a considerable celebrity, especially his "*Flora Siberica, seu Historia Plantarum Siberiæ*," Peterburgh, 1747, 1749, in two parts, large 4to. with one hundred plates: the third and fourth parts were published by S. G. Gmelin. He also published his "*Reise durch Sibirien*," &c.; or Travels through Siberia between the Years 1733 and 1743; Göttingen, 1751, 1752, in four parts, 8vo. with plates. Gen. Biog.

**GMELIN**, SAMUEL GOTTLIEB, son of Philip Frederick Gmelin, was born at Tubingen in 1743; where he obtained both his scholastic and academical education, and graduated M. D. in 1763. He gave early proofs of genius, and during his travels in France and Holland distinguished himself so much by his knowledge of natural history, that he was appointed professor in the Academy of Sciences at Peterburgh. Like the subject of the preceding article, he spent several years in travelling through the distant provinces of the Russian empire, for the purposes of scientific investigation; but ultimately with a less fortunatè result. He was appointed, together with professor Guldenstadt, to explore the province of Astracan, at the time that the transit of Venus over the sun's disk was expected, and set out in June, 1768. Having examined the countries on the western side of the Don, the Persian provinces on the south and south-west side of the Caspian sea, the banks of the Wolga, and, lastly, the eastern side of the Caspian, so dangerous to travellers, he was recalled to Peterburgh. But when he had arrived within three days journey of Kislar, a fortress on the Russian borders, he was seized by the chan of Chaitaks; who plundered him of all his property, treated him with great barbarity, and imprisoned him. The health of Gmelin suffered considerably at this time, and he laboured under a flux, brought on by improper food and the effects of climate; yet the barbarian chief intercepted the provisions sent to him from Kislar. The empress gave orders that he should be rescued by force; but this was rendered impossible at that time by the rebellion of Pugatchef; and Gmelin died in confinement, on the 27th of July,

July, 1774. His death was much regretted by Catherine II., who made a liberal provision for his widow.

His works are; "Historia Fucorum," printed at Peterburgh in 1768, 4to.; a subject to which botanists had paid little attention before him. "Reifen durch Russland, &c.;" or, Travels through Russia, for the purpose of exploring the three kingdoms of nature. This work was published in separate parts, as follows:—Part I. Journey from St. Peterburgh to Tscherkask, in the years 1768 and 1769. Peterburgh 1771 with thirty-two plates. Part II. Journey from Tscherkask to Astracan, from August 1769 to June 1770; *ibid.* 1774, with forty plates. Part III. Journey through the northern districts of Persia, from that period to April 1772; *ibid.* 1774, with fifty-one plates.—Part IV. edited after the author's death, by professor Pallas, Journey from Astracan to Czarizyn; and also a second Persian Journey, 1772-74; *ibid.* 1786, with eighteen plates. The various and important information, contained in these publications, renders the imperfections of the style of this author of little moment. Gen. Biog.

GMELINA, in Botany, received its name from Linnaeus, in honour of John George Gmelin, a native of Tubingen, professor of chemistry and natural history at Peterburgh, who spent ten years in travelling through Siberia, at the expense of the Russian government, and whose *Flora Sibirica*, in four vols. quarto, with plates, is a book of great reputation and merit. The first and second volumes were published in his lifetime; the third and fourth long after his death, which happened in 1755, at the age of 46. He took his arrangement from Van Royen. Haller says the plates are unworthy of the beautiful drawings, which he himself had seen.—This genus also serves to commemorate four or five more botanists of the same family, especially Samuel Theophilus Gmelin, nephew of the former, and his successor in the professorship, who published a *Historia Fucorum*, with plates, in 1768, one of the most popular books on submarine botany, and who died in 1774, aged 31.—Linn. Gen. 315. Schreb. 412. Willd. Sp. Pl. v. 3. 313. Mart. Mill. Dict. v. 2. Juss. 108. Lamarek. Illustr. t. 542. Gært. t. 56. (Michelia; Amman. in Act. Petrop. v. 8. 218. t. 18.)—Class and order, *Didymia Angiospermia*. Nat. Ord. *Perfonate*, Linn. *Vitices*, Juss.

Gen. Ch. Cal. Perianth very small, inferior, of one leaf, nearly globular, with four small unequal teeth, permanent. Cor. of one petal, ringent, inflated; its limb four-cleft; the upper segment large and vaulted; lower, and lateral ones, smaller, obtuse, rounded, spreading. Stam. Filaments four; the two uppermost thicker and shorter; two lowermost curved upwards; anthers two-lobed; two of them sometimes smaller and simple. Pyl. Germen superior, roundish or obovate; style as long as the longer filaments, ascending; stigma acute. Peric. Drupa ovate, of one cell. Nut obovate, smooth, of three cells, the lowermost abortive. Seeds solitary.

Eff. Ch. Calyx with four slight teeth. Corolla four-cleft, ringent, bell-shaped. Anthers cloven. Drupa superior. Nut of two fertile cells.

1. *G. asiatica*. Linn. Sp. Pl. 873. Burm. Ind. 132. (Jambusa sylvestris parvifolia; Rumph. Amb. v. 1. 129. t. 40.)—Leaves roundish, somewhat three-lobed, acute, downy beneath.—Native of Java, Amboina, and other parts of the East Indies. A tree, with straight, roundish, slightly downy branches. Leaves opposite, scarcely two inches long, of a roundish or elliptical form, acute, most generally furnished with a short broad lobe at each side, entire; smooth above; pale and downy beneath; the midrib leading off two principal lateral ones, a little above its base, and se-

veral smaller ones higher up, all which are branched. Foot-stalks downy, various in length, often nearly equal to the leaf, each with a small hairy bud above its insertion, and above that usually a straight, downy, horizontal spine. Flowers in a short, simple, downy, terminal racemus. Calyx downy, besprinkled with several large, shield-like, smooth glands. Corolla large, yellow.

Rumphius's figure unquestionably belongs to this plant, but his description seems that of an *Eugenia*. Plukenet's t. 305. f. 3. is certainly *Gardenia dumetorum*, and resembles our *Gmelina* only in being thorny; his t. 97. f. 2. may possibly be intended for *Gmelina parvifolia*, but is of no use as to determining it.

2. *G. elliptica*.—Leaves elliptical, undivided, obtuse, downy beneath. Thorns none.—Native, we presume, of the East Indies, confounded in the Linnaean herbarium with the foregoing, from which it differs in having rather larger leaves, which are exactly elliptical and blunt, more densely downy beneath, and not lobed. There are no traces of thorns. The inflorescence is rather more compound, but the remarkable glandular calyx is the same. If a variety it is a very extraordinary one.

3. *G. parvifolia*. Roxb. Corom. v. 2. 31. t. 162. (*G. coromandelica*; Burm. Ind. 132.)—Leaves obovate, undivided or three-lobed, smooth on both sides.—Common in every forest and uncultivated place on the coast of Coromandel, flowering in October and November. Roxburgh. It is often intermixed with *G. asiatica*, from which it differs in its more humble size, larger and constant thorns, and especially in its smaller leaves, which are smooth on both sides. Their flowers and fruits are alike, the latter being yellow, obovate, the size of a small cherry. We perceive on one calyx in our specimen a solitary gland, like those described in the two former.—Dr. Roxburgh mentions that cold water, stirred with a leafy branch of this shrub, becomes thick, from the abundant mucilage of the leaves, and is used in that state as a remedy for the heat of urine which accompanies gonorrhoea. Water stirred with branches and leaves of *Petalium Murex* becomes in like manner mucilaginous, and is used for the same purpose, but soon loses its consistency, which is not the case with such as is prepared with this *Gmelina*. The Telings call the plant *Shiri gomoodoo*. It may possibly be Plukenet's *Lycium Madraspatanum*, t. 97 f. 2, as Burmann takes it to be, but Sloane's *Rhombus*, Hist. of Jamaica, v. 2. t. 207. f. 1, cannot be the same, though his vile figure affords no distinct indication of what he means.

4. *G. arborea*. Roxb. MSS. (Cumbula; Rheede Hort. Mal. v. 1. 75. t. 41.)—Leaves heart-shaped, undivided, pointed, downy beneath; their lateral ribs elevated. Thorns none.—Sent from the coast of Coromandel by the Rev. Dr. Rottler, with the above name of Dr. Roxburgh. Gærtner has most justly pointed out the *Cumbula* of Rheede as a *Gmelina*, though quoted by Linnaeus, doubtfully indeed, for his *Bignonia Catalpa*. This is a tall and upright tree, growing in sandy ground, with downy branches, and large, opposite, stalked, heart-shaped, entire leaves, downy and veiny beneath. Thorns none, as far as we can learn. The flowers are numerous and handsome, yellow, growing in compound, hairy, terminal clusters. Fruit yellow, obovate, rather small.

5. *G. indica*. Burm. Ind. 132 t. 39 f. 5. (*Dory Zee-kou* of the Malays.) Leaves alternate, heart-shaped, crenate, smooth on both sides.—Native of Java. *Herb. Linn. A. Arab. or Ind.*, with round, somewhat zig-zag, slightly downy branches. Leaves from half an inch to an inch long, alternate, on short hairy stalks; veiny, bluntly crenate. Thorns straight,

straight, slender, acute, mostly longer than the leaves. The *flowers* and *fruit* seem to be unknown. We have only Burmann's very feeble authority for making this a *Gmelina*, which its alternate crenate leaves strongly discountenance, nor did Linnaeus ever venture to adopt it. S.

GMUND, in *Geography*. See GEMUNDEN.

GNAA, a town of the duchy of Stiria; 24 miles S.E. of Gratz.

GNADENHUETTEN, a settlement of the Moravians in America, situated on Muskingum river, opposite to Salem, in the lands which belonged to the Mahikan Indians.—Also, the name of a Moravian settlement, on the S.W. bank of Lehigh river, in Pennsylvania, about 29 miles N.W. of Bethlehem.—Also, a Moravian settlement, called *Novo Gnadenhuetten*, on Huron river, about 22 miles from Lake St. Clair, in the county of Wayne, and 28 N.W. of Detroit.

GNAPPEZEIK, a town of Birmah, on the Irawaddy; so called from Gnapee, or Napee, a sort of sprat, half pickled and half putrid, used as a sauce by the Birmanians, and forming an extensive branch of trade: 110 miles N.N.W. of Rangoon.

GNAPHALIUM, in *Botany*, γναφάλιον, an ancient Greek name, from γνάφον, soft down or wool, such as is plucked from cloth in dressing it, alluding to the wooliness of the herbage. Many writers have contended that *Santolina maritima* of Linnaeus, and Sm. Fl. Brit. 860, is the true γναφάλιον of Dioscorides, an opinion extremely difficult to establish or to contradict, as all he says of it is, that "its leaves are white and soft, useful for stuffing." However this may be, Tournefort, and lately Gærtner, have retained that plant, as the true and only species of *Gnaphalium*. The *Gnaphalium* of Linnaeus however is a very extensive and comprehensive genus, from which some species have of late been separated. See ELICHRYSUM—Cud-weed—Linn. Gen. 419. Schreb. 550. Willd. Sp. Pl. v. 3. 1849. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 3. 173. Sm. Fl. Brit. 867. Juss. 179. (Elichrysum; Gærtner. t. 166. Antennaria; Gærtner. t. 167. Anaxeton; Gærtner. t. 166? Filago; Gærtner. t. 166. See FILAGO.) Class and order, *Syngenesia Polygamia-jusvisflua*. Nat. Ord. *Compositae Nucamentaceae*, Linn. *Corymbiferae*, Juss.

Gen. Ch. *Common calyx* imbricated, rounded; scales numerous, the marginal ones rounded, scariose, coloured. *Cor.* compound; *florets* of the disk perfect, tubular, funnel-shaped, in five equal reflexed marginal segments; some female ones, without a corolla, are often intermixed towards the margin. *Stam.* (in the perfect florets) Filaments five, very short, capillary; anthers forming a cylinder. *Pist.* (in the same florets) Germen ovate; style thread-shaped, the length of the stamens; stigma cloven. In the female ones the same. *Peric.* none, except the permanent shining calyx. *Seeds* in both kinds of florets alike, solitary, oblong, small, crowned with capillary or feathery down. *Recept.* naked.

Ess. Ch. Receptacle naked. Down capillary or feathery. Calyx imbricated, its inner scales rounded, scariose, coloured.

Willdenow reckons 146 species of *Gnaphalium*, of which 32 are shrubby, with silvery, white or crimson flowers, or rather without any golden tinge; 12 are of a yellow or golden colour, likewise shrubby; 19 are herbaceous, with yellowish flowers; 28 herbaceous, with white or reddish ones; and 29 have the inconspicuous whitish blossoms of the *Filago* family. The remaining 26 are species defined by Thunberg, without any attention to these leading fractions of the genus, so that it is impossible to say to which

they belong. Ten species, all herbaceous, are described as natives of Britain.

In this large genus it is by no means certain that all the species correctly answer to the generic character, particularly in the receptacle; which is not always strictly naked, but bears a few bristles towards the margin, thus becoming an *Anaxeton* of Gærtner.

The marginal scales also, being sometimes a little pointed and reflexed, intrude upon the proper character of *Elichrysum*; see that article. In fact these genera are naturally one and the same, but, on account of their great extent, are conveniently separated by the character, though an imperfect one, of the more radiating calyx of *Elichrysum*. Linnaeus's error consisted in referring the latter to *Xeranthemum*, which has a different habit and a chaffy receptacle.

The first species in Willdenow, *G. eximium*, Linn. Mant. 573. Curt. Mag. t. 300, is one of the most splendid. The *leaves* are clothed with very thick white wool, and the shrubby stem is terminated by a large corymbus of *flowers*, whose calyx is the size and shape of a raspberry-fruit, of a rich shining crimson. The *florets* are orange-coloured. It grows about 500 miles up the country above the Cape of Good Hope, and was for a long time known to European botanists merely by dried specimens, (one of which is figured by Edwards in his History of Birds, t. 183), brought occasionally to the Cape by the distant settlers.

Several others of the shrubby kinds are very ornamental to our green-houses.

Of the herbaceous sorts *G. fatidum*, whose flowers, usually yellow, are occasionally white or silvery, always very splendid, is one of the most remarkable, but the strong smell of its viscid herbage when touched is offensive to most people. *G. orientale* is somewhat shrubby, though ranged with the herbaceous ones. Its shining lemon-coloured flowers frequently serve for ornamental purposes, and are known by the name of *Everlasting*, a name appropriate to the whole genus.

*G. margaritaceum*, Engl. Bot. t. 2018, serves in Wales, where it grows wild, to adorn the graves of the departed, elegantly alluding to immortality by the unfading nature of its flowers, and to spotless purity by their snowy whiteness. This plant is often cultivated in cottage gardens.

*G. dioicum*, Engl. Bot. t. 267, the *Antennaria* of Gærtner, so called from its plummy crown to the seed, is one of our most elegant species, found on dry rather mountainous heaths. The *flowers* are of a beautiful rose-colour.

The Cape of Good Hope is most fertile in this genus, but several fine species grow in South America, and there are some from New Holland to be added to what are enumerated in Willdenow. The mountains and fields of different parts of Europe produce various species, but few of the more handsome, except *G. arvenarium*, Fl. Dan. t. 641, and its near relation *G. olympicum* of our gardens, gathered about the Bithynian Olympus by Dr. Sibthorp; both which vie with *G. orientale* in their shining golden or lemon colour, and the *olympicum* at least is a hardy perennial, of easy culture.

GNAPHALIUM, in *Gardening*, affords plants of the herbaceous and under shrubby kinds: of which the species mostly cultivated are, the tree everlasting (*G. arborescens*); the red-flowered everlasting (*G. igneum*); the eastern everlasting, or immortal flower (*G. orientale*); the sweet-scented everlasting, or eternal flower (*G. odoratissimum*); the American everlasting, or eternal flower (*G. margaritaceum*);

taceum); the plantain-leaved everlasting (*G. plantagineum*); the common shrubby everlasting, or flechas (*G. flechas*). Many of these are curious plants.

*Method of Culture.*—The first four sorts may be increased by slips from the heads or cuttings; by planting them in pots of light earth in the spring or summer months, and plunging them in a moderate hot bed, refreshing them often with water. When they have taken full root, they may be removed into separate pots, and be placed among other plants of the hardy exotic sort. They require the protection of a frame in the winter season.

The seventh species may be increased in the same manner, being placed at once where it is to remain, in a shady sheltered border, or other place that is proper.

The fifth and sixth sorts may be easily raised by dividing and planting their creeping roots where they are to grow, either in the autumn or spring months.

These three last are sufficiently hardy to stand the open air in warm situations.

They are all ornamental plants, the former in the greenhouse collection, and the latter in the open ground.

**GNAPHEUS**, in *Icthyology*, a name given by Athenæus and other of the Greek writers to the tench.

**GNARP**, in *Geography*, a town of Sweden, in the province of Hellingland; 20 miles N of Hudwicksfwal.

**GNAT**, in *Entomology*. See **CULEX**.

There is no species of insect that we have so much reason to dislike in regard to the injury it does us as the gnat. Others indeed give us more pain with their stings, but it is but by accident that we are struck by them; the gnats thirst for our blood, and follow us about in whole companies for it. There are many marshy places where the legs and arms are all the summer swelled to an enormous size by the repeated bitings of these insects, and in many other countries they are much more troublesome than with us.

But as troublesome enemies as these little creatures are to us, there is that about them which is extremely worthy our admiration; nor can we indeed fail greatly to admire even the very instrument of the mischief they do. They have beside this many very observable particulars in the course of their lives.

All the naturalists of late years have applied the microscope to the examination of the parts of this little animal, and Swammerdam, Hook, Bonanni, Leeuwenhoeck, &c. have given very good accounts, and very valuable drawings of the creature.

There is a great number of very small species of gnats, and though some are considerably large, yet none even of these approaches to the size of the tipula, or father long-legs, as commonly called. The larger tipulae are therefore easily distinguished from the gnats; but Swammerdam, Goedart, Lister, and others, have very often given us the smaller tipulae among the species of gnats. Both have long slender bodies, and both prominent coreclets, which make them look hump-backed; but when either of these insects is taken into the hand it is very easily known, the gnat having a very long trunk, and the tipula no trunk at all.

There is a prodigious number of species of the gnat kind, comprehending the smaller ones; Dr. Derham observed near forty different species about Uppminster in Essex; but of those of a size to be remarked with ease, and without the help of glasses, there are three principal kinds: the one has its body variegated with white and black; this is the larger kind, and its coreclet is streaked with black or deep brown, and white lines or greyish ones; these have brown eyes; another is smaller than this species, and has a plain brown body,

the colour of the coreclet, and that of the eyes is the same as in the larger or first species; the third kind is the smallest of the three and the most common, has its coreclet reddish, or of a faded reddish yellow, and the body whitish, and on the under part of the belly every ring has one single brown spot; the rest is grey: the eyes of this species are of a very pleasant green.

All the gnats have a long cylindric body composed of eight rings; their coreclet is short but large, in proportion to the size of the fly, and to this are fixed the six legs, which are hairy, with six joints to each, and at the end two little claws, the wings, and the balancers: four stigmata are also found here, as is the case in other flies: the two first of these are placed near the head, and have been mistaken for ears.

The antennæ of gnats are extremely worth observation, and differ much from one another. Some of them are elegantly feathered; these belong to the males of certain species, for the antennæ of the females are not so beautiful. The brush-horned or male gnat has two pair, one of which is ferrouded, at small distances, with long hair, issuing out circularly, each circle lessening as it approaches the extremity of the antennæ; the other pair are longer and much thicker, and hairy from end to end. In the great bellied or female gnat, the first pair of antennæ, though of the same figure as the male's, has hairs not near so long, and the second pair is shorter than the first by at least three parts in four. Reaumur, Hist. Inf. vol. iv. p. 574, &c. Baker's Microf. 1743, p. 203, &c. For the trunk and wings of the gnat, see **TRUNK and WINGS**.

**GNATS, Eggs of**. See **EGGS**.

For the *Eyes of GNATS*, see **EYES of Flies**.

**GNAT-worm**, in *Natural History*, a small water insect, produced of a gnat, and which is, after its several changes, transformed into a gnat again.

From the eggs, deposited by the gnat on the surface of the water, proceed a number of minute worms, which sinking to the bottom of the water, form for themselves coverings of fine sand or earth, cemented together with a sort of glue, but open at both ends, that they may come out and enter as occasion requires.

These worms do not frequent rivers; but ditches, ponds, and other standing waters, afford them in vast abundance, from the middle of May till toward the beginning of winter. This is the reason why watery and marshy places are found most to abound with gnats, and why the wet summers are found to produce the greatest numbers of them: because in dry seasons, the ponds and ditches, where they are to pass their worm-state, are dried up, and the worms killed. These are creatures, however, that one need not go far to seek, since a vessel of water, exposed in any open place in the summer months, will not fail to afford plenty of these worms in a little time.

Before these worms are arrived at their full growth, though they are then but small, they are easily found, because they are under a necessity of coming frequently to the top of the water, by having occasion for frequent respiration: and to do this, they are obliged to keep the end of a small pipe they are furnished with, from the largeness of their body, above water. The end of this pipe is hollow and indented, and forms a sort of funnel on the surface of the water: it is of the length of about three rings of the body, and is somewhat thicker at its insertion than at its extremity.

As there is a vast number of species of gnats, there is no lack of the worms from whence they are produced: and to this is in a great measure owing the variety in the figures given

of the worms by the authors who have treated of them; which may also be not a little added to by the particular views in which those draughts have been taken. Notwithstanding all the variations of these figures, the general form of the animal is however the same in all, and the species cannot but be known from any of them. While the worm is young, the body is whitish or greenish; but when it is at its full growth, and draws near the time of its changes, it becomes greyish. The great transparency of the body of this worm gives a fine view of what passes within it; it is at any time easy to see into the motion of the intestines, by which the food is pushed on towards the anus. The two principal tracheæ are also seen very distinctly in this creature; they are two white tubes placed in a parallel direction one to another, and run from the first ring to the tube of respiration.

The great worm several times changes its skin in the course of its life. After three changes of this kind, which usually happen in the space of three weeks, or thereabout, it undergoes a fourth, where the old skin is as easily thrown off as in the rest, but the animal now appears in a new form, that of a nymph; it is now shorter and rounder than before, and the body is so bent that the tail is applied to the under part of the head; this, however, is only its form in a voluntary state of rest, for it can yet move, and when it pleases extends its tail, and swims about as swiftly as when in its other state.

When the creatures have quitted their first habitations and the figure of worms, they re-ascend to the top of the water, inclosed in a kind of shell, with a large head and mouth, two black eyes, two horns, several tufts of hairs on different parts of the body, and a tail with a brush of hair at the end of it, which, being smeared over with an oily fluid, serves to keep them above water; their heads being sometimes lifted in the air, and sometimes plunged into the water, while the tail slides along the surface; and when the oil on the tail begins to dry, they shed from their mouth a fresh supply, which renders it capable of steering where they please, without being wetted and damaged by the water.

All the parts of the future gnat may be seen in this nymph; the skin of it is extremely thin and transparent, yet sufficiently tough and firm for the use it is intended for. It is uncertain how long exactly the animal lives in this nymph state; but after the time is accomplished, its change into a gnat is very quick, and is attended with great danger to the animal, since multitudes are drowned in the act of getting out and springing into the air. Reaumur, Hist. Inf. vol. iv. Baker's Microf. 1743, p. 88.

GNAT, in *Rural Economy*, a small well-known insect, which is said to destroy the leaves of some tender vegetables as soon as they appear, such as the turnip, &c.

GNEISS, in *Mineralogy*, a primitive rock, composed of feldspar, quartz, and mica; ingredients which are likewise those of granite, from which it differs in the arrangement of those parts; for while in the latter rock they usually appear as granular aggregations, those of gneiss are disposed in such a manner as to exhibit a more or less slaty structure. This structure passes through various degrees of distinctness; on one hand it approaches so near to the granular texture, that the distinction between gneiss and granite ceases to exist, while, on the other hand, when its peculiar texture is very obvious, and becomes what is termed *thin slaty*, a passage is formed into the primitive rock, next to it in antiquity, called mica-slate. In its progress towards the nature of granite, the feldspar is generally predominant with regard to the mica; while those varieties approaching mica-slate gradually exhibit a smaller proportion of feldspar and much mica. Sometimes, however, the mica is only apparently predominating, owing to the circumstance, that on breaking a mass of gneiss, the

line of separation will more frequently pass through the mica than through the other layers, and display a whole surface of that substance; but another fracture, perpendicular to the first, will, in this case, soon deceive the observer. Though feldspar is, generally speaking, the predominant ingredient of gneiss, yet the proportion of mica in this rock is, upon the whole, greater than what we see it in granite: and the less this is the case, the more the mass appears granular, and the more it approaches to granite. It is often a matter of difficulty, in viewing small specimens only, to distinguish some kinds of gneiss from the last-mentioned primitive rock; when the inspection of the former in their natural situation, and on a large scale, would have left but little doubt in the mind of the examiner.

Gneiss, viewed in the large, as a mountain mass, always exhibits thick and distinct strata, whose outgoings, or upper terminations, are generally lower than the subjacent granite, and higher than those of the superincumbent mica-slate.

Werner (to whom we owe more correct ideas respecting this rock,) distinguishes four kinds of gneiss, *viz.* that approaching the granular structure, the waved or undulated, the common, and the thin slaty gneiss. As particular varieties of these, we have 1. The striped gneiss, in which the quartz is disposed in narrow bars, surrounded by feldspar, producing, on its longitudinal fracture, a striped appearance, not unlike that of some kinds of petrified wood; while its transversal fracture exhibits a granular disposition of the parts. This striped variety generally occurs together with the waved; such as at Ober-Newshöberg, Reiland and Hartmansdorf, near the Bohemian frontiers. 2. The sprinkled, or that kind of gneiss in which the feldspar and mica exhibit themselves in the form of small nests: such as that found at Hartmansdorf and Bobritsch, near Freiberg, and at Kuffenberg in Bohemia. 3. The short lamellar or flaky variety, such as it is found at Marienberg.

The colour of the ingredients of gneiss is not subject to great variation. The feldspar is generally of a greyish, yellowish, and reddish-white colour, seldom yellowish-grey, or deep flesh-red, as it appears in many varieties of granite; upon the whole, its tint resembles that of the quartz with which it is accompanied, and which seldom appears smoky-grey or brown. The colour of the mica is generally black or brownish-black, sometimes brownish, yellowish, and ash-grey, and rarely silver-white or of a golden hue.

These component parts are found to vary also in regard to their *fractures*; in general the feldspar is perfectly foliated and shining; but sometimes it appears in incipient decomposition, or even converted into petunze; in the same manner as the mica is now and then seen passing into a greenish substance resembling steatite. Dr. Reufs found that the porcelain earth dug at the Galgenberg, near Puschwitz, in the Saatz district of Bohemia, where it is used for white-washing walls, is the result of the highest stage of decomposition of gneiss; it forms thick strata, and contains a great quantity of small greyish white, light grey, and pale clove-brown grains of quartz. In the same manner this mineralogist observed in that country frequent proofs of the conversion of the feldspar of gneiss into a ferruginous clayey mass. Near Klöckerly it is seen converted into burnt-thon or variegated clay.

Besides the more essential feldspar, quartz, and mica, the following *accidental ingredients* are now and then met with in gneiss. 1. Shorl: both the common and black tourmaline shorl, sometimes occur in the gneiss of Freiberg, and particularly of Spain. 2. Garnet: rarely, but much more frequently than in granite; it occurs at Wiefenthal in Saxony, in Norway, in the island of Zealand, in Moravia, &c. 3. Horn-blende



blende: is but seldom found, and only in the thin slaty variety of gneiss, which passes into mica and hornblende slate.

4. Steatite: occurs principally in the gneiss forming the walls of the metalliferous veins in the Freiberg district; it is considered by some as mica thus transformed by sulphuric acid.

5. Actinote: is said sometimes to constitute an ingredient of gneiss in Switzerland and Hungary. Metallic substances that are sometimes found disseminated in gneiss, in the vicinity of veins, cannot properly be enumerated even as accidental component parts of this rock.

Gneiss abounds in metals more than any other rock, as may be seen from the richness of the Saxon and Bohemian mines, those of Salzburg, &c. There are but few among the known metals that are not found in it, either in veins or beds. "The oldest gneiss in the Saxon Ertzgebirge," says Mr. Jameson, "that with reddish-coloured feldspar, is the least productive in ores; but the newer, with white coloured feldspar, is the most productive; and the veins, though small, are numerous. The oldest venigenous formation appears to be that which contains tin-stone. The tin-ore is accompanied with wolfram, molybdena, arsenic-pyrites, fluor-spar, chlorite, topaze, and opal. The second venigenous formation appears to be a lead-glance formation. The third formation consists principally of copper, and the ores are grey copper-ore, copper-glance, copper-pyrites, and variegated copper-ore. The fourth formation, which is very extensive, contains ores of cobalt. The newest formation is that which contains ores of silver. Veins containing antimony, and red iron-stone occur in gneiss, and these are supposed to be newer than any of the preceding. The metalliferous beds that occur in this rock contain argentiferous lead-glance, blende, copper and iron-pyrites. It sometimes also contains formations of gold."

There are three considerable beds of rocks *subordinate* to, and synchronic with, gneiss, and which are therefore not seen in granite, *viz.* granular limestone, as it is observed, for instance, near Freiberg; primitive trap, such as hornblende-slate, at Kuttentberg in Bohemia, at Kongberg in Norway, &c.; and the older porphyry. (See LIMESTONE, TRAP, and PORPHYRY.) Also small beds of common garnets, actinote, with magnetic iron-stone, iron-pyrites, galena, &c. now and then occur in gneiss.

Gneiss being generally superincumbent on granite, is hence considered as next to this primitive rock in point of age: there is, however, also a difference in the relative antiquity of the different kinds of gneiss, and on the whole it may be said that the nearer it approaches in its texture to *Mica-slate*, (see that article,) the more recent is its origin. From this it does not, however, follow that there should not be found kinds of gneiss which surpass in antiquity even some kinds of real granite. (See GRANITE.) The very thick flaky varieties of gneiss, with black mica and a small proportion of mica, may, in general, be said to be of more ancient formation.

Gneiss, though far less widely distributed than granite, has still a considerable range; it extends over the greatest part of the Saxon Ertzgebirge: the country about Freiberg, Glashütte, Marienberg, Ehrenfriedersdorf, consisting almost entirely of it. In the same manner it is the characterizing rock of the Bohemian mountainous mining district. It is also found in Silesia, Carinthia, in some parts of the Black Forest in Suabia; nor is it wanting in the Tauriskian mountains, in Salzburg, in the Swiss Alps, the Pyrenees and Vosges, in Scandinavia, Greece, &c. In Great Britain it has been observed particularly in Scotland, in the islands of Coll, Tiree, Rona, and in the Shetland islands. It should

however be observed, that frequently other rocks have been described as gneiss by topographical writers.

The *economical use* made of gneiss is that for paving, and for the construction of walls; for both which purposes it is extremely well calculated, by reason of the facility with which it is wrought by the mason. Hence in the Saxon mining district not only almost all buildings are constructed of gneiss, but also the walling of the shafts and levels, most advantageously executed in this useful rock.

GNEMON, in *Botany*, a tree so called in the island of Ternate and others of the Moluccas, which is named in the Malay language *Menigo*, or *Meningo*, a word apparently of the same derivation, whatever that may be. See GASTUM.

GNERDEN, in *Geography*, a town of Persia, in the province of Irak; 150 miles E. of Ispahan. N. lat. 32° 20'. E. long. 55°.

GNERROUTOCH, a town of Birmah, on the Irrawaddy; 10 miles N. E. of Pagan.

GNESEN, or GNESSA, a city of Poland, in the duchy of Warsaw, built, as it is said, by King Lechus I., founder of the monarchy, and called *Gnesia*, from an eagle's nest found there, denominated in the Polish language *Gniazdo*. The kings of Poland were crowned in this city, and the regalia were kept here till, in the year 1320, they were removed to Cracow. During the independent existence of Poland, it was famous as the see of an archbishop, who was primate of Poland, and who acted as interrex or regent upon the king's demise; and who also announced the event, convoked the diets and dietines of convocation, and performed the functions of royalty. Gnesia is 100 miles N. E. from Breslaw, and 150 W. from Warsaw. N. lat. 52° 26'. E. long. 17° 42'.

GNETUM, a name contrived by Linnæus, as we presume from *gnosis*, *brotherhood*, alluding to the situation of the numerous male and female flowers, several of each together in each whorl. Linn. Mant. 18. Schreb. 659. Willd. Sp. Pl. v. 4. 591. Mart. Mill. Dict. v. 2. Juss. 406. (Thoa; Aubl. Guian. v. 2. 874. Schreb. 650. Juss. 406. L'encour Illustr. t. 784.) Class and order, *Monocotyledonade phloa*. Nat. Ord. *Urticis affinis*, Juss. or rather, as he himself hints, to be referred to a new order, which he proposes to term *Piperis*.

Gen. Ch. Cal. Catkin composed of several rennet, callos, thickened whorls, each subtended by a small *partial calyx*, which is peltate, orbicular, flat, entire, containing several fertile florets, the male ones inferior, the females superior, in the same whorl. Perianth of the male a minute, ovate, coloured scale. Cor. none. Stam. Filament one, thread-shaped, longer than the scale; anthers in pairs, connected.

Perianth of the female a rude, lacinated scale. Cor. none. Pist. Germen ovate, superior, immersed in the receptacle of its own whorl, the length of the stamens; style conical, stout; stigma three-lobed, acute. Peric. Drupa ovate, of one cell. Seed. Nut solitary, oblong, flattened, of one cell.

Ess. Ch. Male, Calyx an undivided scale of a whorled catkin. Corolla none. Filament one, with a pair of anthers. Female, Calyx a torn scale of the same whorl. Corolla none. Stigma three-lobed. Drupa with one seed.

Obs. Linnæus observes that Rumphius makes his plant dioecious, but he found it monœcious, and even saw one catkin entirely male, standing on its own footstalk, near a female floret. The *Thoa* of Aublet, though somewhat differently described, is undoubtedly the same genus, and indeed so like the original *Gnetum* in foliage, that it is not very easy to distinguish them.

1. *G. Gnemon*. Linn. Mant. 125. (*Gnemon domestica*; Rumph. Amboin. v. 1. 181. t. 71, 72. *Berectinus fructus*; Clus. Exot. 55)—Lateral veins of the leaves prominent, inter-branching archwise half way towards the margin. Catkins opposite, axillary, on simple stalks.—Native of the Molucca islands, and other parts of the East Indies. We have it from Java. A tree, with straight, round, slender, smooth branches, swelling at each joint, under the insertion of the leaves, and somewhat forked at the ends. Leaves opposite, stalked, ovate, inclining to lanceolate, pointed, entire, smooth and shining, three or four inches long, furnished with a midrib, channelled above, prominent beneath, sending off several alternate, spreading, prominent though slender veins, which meet rather more than half way towards the margin in one common arching vein, whence numerous reticulations originate. Stipules none. Footstalks half an inch long, channelled and keeled. Catkins axillary, shorter than the leaves, two together from each opposite leaf, on simple stalks, their whorls when young crowded, but soon becoming distant and bead-like, every whorl bearing numerous female as well as male flowers. What Linnæus describes as a torn scale in the former, seems rather a very dense assemblage of short tufted fibres. Fruit the size of an ordinary acorn or filbert, its coat thin, sweetish according to Rumphius, but with too much acrimony to be eaten raw; as is also the case with the leaves, which, when dressed, are in almost daily use among the natives of Amboyna, though thought mawkish and insipid by Europeans.

2. *G. Thoa*. (*Thoa urens*; Aubl. Guian. v. 2. 874. t. 336.)—Lateral veins of the leaves obsolete, inter-branching archwise. Catkins on simple stalks, from the repeated forks of the branches.—Gathered by Aublet in the woods of Guiana, where the natives call it *Thoa*. His own specimen in our possession has no fructification nor inflorescence, so that we have been obliged to take part of our character from his figure. The leaves seem in general to be rather shorter and broader than in the former, but the chief distinction is observable in their lateral veins, which though they do in a similar manner run into one common arching vein, above half way towards the margin, are all together far more slight and less prominent than in the first species. The fruit is like the former, reddish, and elliptical. Aublet says that when its outer skin is taken off, a dry substance is found underneath, composed of stiff depressed hairs, which easily separate from each other, and if any of them fall upon the human skin, they cause a great itching. The kernel of the nut, boiled or roasted, is good to eat. Birds of the fowl or pheasant tribe feed in the woods upon this fruit, which they swallow whole. The same author assures us that a clear gum issues from the bark and branches, but that when the main trunk or great branches are cut, a clear tasteless watery liquor runs out, which may be drunk by those who are distressed for water. This tree is almost always in flower and fruit. Aublet describes the catkins as male, with two female flowers at their base. This is so different from our specimens of *G. Gnemon*, that it might almost afford a specific character, but Rumphius describes the same circumstance in what he terms his male *Gnemon*, and Linnæus adverts to something like it. It should seem therefore that in the first, if not in every species, the genus is imperfectly diœcious, one tree bearing catkins with female flowers, with perhaps less perfect males, in every whorl, while on another are found more efficient males in every whorl, with females at the base only, as in Aublet's *Thoa*. Such examples throw great light on the physiology of vegetable generation, and confirm the Linnæan theory.

3. *G. funiculare*. Buchanan MSS. (*Gnemon funicularis*;

Rumph. Amboin. v. 5. 12. t. 8. Ula; Rheed. Hort. Mal. v. 7. 41. t. 22.)—Lateral veins of the leaves separate to the margin. Catkins opposite, axillary, on branched stalks.—Native of Amboyna and other places in the East Indies. This is a long trailing branched smooth shrub, turning black in drying, which the two former do not. The leaves are four or five inches long, various in breadth, pointed, firm, shining, distinguished by their veins continuing distinct to the edge of the leaf. The flower-stalks are axillary, in pairs, more or less branched and forked; each catkin being about an inch long, composed of numerous orbicular imbricated scales concealing the flowers, and not unaptly compared in the Hortus Malabaricus to Long Pepper. Each stands on a partial stalk, of about its own length. The fruit resembles that of the foregoing, and is roasted over the fire, which renders the kernel eatable. The tender leaves serve for a pot-herb, like those of *G. Gnemon*. The bark of the young twigs, split into thread, serves to make nets.

Rumphius's vol. 5. t. 7, which he calls *Fanis Gnemoniformis*, but of which he seems not to have known the flowers, may possibly be the male plant of our last-described species, bearing only one or two female flowers at the bottom of the stalks of the male catkins, according to the analogy observed in the foregoing ones. S.

GNIAFDA, in *Geography*, a town of Hungary; 7 miles W.S.W. of Palotza

GNIDIA, in *Botany*, from *Gnidus*, where Venus had her temple. A seed, reported to be brought from thence, had been called *Coccognidium*, and there is a *γνίδιον*, or *Kuidion*, supposed to be a kind of Orache; but Linnæus probably had not these so much in view as the affinity of this genus to *Passerina*, named after a favourite bird of the goddess, in allusion to which indeed it was first named *Struthia* by Van Royen. It is moreover akin to *Daphne*, one species of which, *Daphne Gnidium*, has been taken for the ancient *γνίδιον*.—Linn. Gen. 193. Schreb. 260. Willd. Sp. Pl. v. 2. 424. Mart. Mill Dict. v. 2. Ait. Hort. Kew. v. 2. 27. Juss. 77. Lamarek Illustr. t. 291.—Class and order, *Oleædria Monogynia*. Nat. Ord. *Vesiculae*, Linn. *Thymelææ*, Juss.

Gen. Ch. Cal. Perianth inferior, of one leaf, funnel-shaped, coloured; its tube thread-shaped, very long; limb flat, in four deep segments. Cor. Petals four, sessile, flat, inserted into the edge of the tube of the calyx, and shorter than its limb. Stam. Filaments eight, bristle-shaped, erect, inserted into the tube in two rows, the uppermost reaching nearly to the top; anthers roundish, erect, simple, of two cells. Pist. Germen ovate, superior; style thread-shaped, as long as the tube, inserted laterally into the germen; stigma capitate, hispid. Peric. a dry berry, with a thin coat. Seed solitary, ovate, obliquely pointed.

Ess. Ch. Calyx funnel-shaped, four-cleft, withering, including the filaments. Petals four, inserted into the calyx. Style lateral. Seed coated.

Obs. It differs from *Passerina* only in having petals; which are often rather of a glandular appearance. The habit is altogether that of *Daphne* and *Passerina*. Willdenow enumerates sixteen species, but of these *G. pinifolia* and *radicata* are one and the same, and *G. daphnefolia*, Linn. Suppl. 225, seems rather to belong to *Dais*.

All the genuine species are natives of the Cape of Good Hope, of a humble shrubby growth, with white or yellowish sweet-scented flowers.

GNIEWE, or MIVE, in *Geography*, a town of Prussia, in the province of Pomerelia, on the Vistula; 30 miles S.S.E. of Dantzic.

**GNOIEN**, a town of the duchy of Mecklenburg; 21 miles E.S.E. of Rostock. N. lat.  $53^{\circ} 59'$ . E. long.  $12^{\circ} 52'$ .

**GNOLL RAIL-WAY**. This is an establishment in Glamorganhire, in South Wales, which we had not heard of at the time of compiling our article **CANAL**; it is called an iron *waggon-way*, the flanch being on the wheels of the waggons, instead of being on the tram-plates, as is more common in that district. It commences at the flipping-place 200 yards below Neath bridge, on the Neath river; crosses the Neath canal on a wooden bridge, and proceeds about E. half a-mile to the late fir Herbert Mackworth's Gnoll collieries, of run coals, which are drawn up forty fathom, to be loaded into the waggons on this waggon-way, which has so regular a descent, as to require no inclined planes, or other considerable works.

**GNOMES**, **GNOMI**, a name which the Cabbalists give to certain invisible people, whom they suppose to inhabit the inner parts of the earth, and to fill it to the centre.

They are represented as very small of stature, tractable, and friendly to men; and are made the guardians of mines, quarries, hidden treasures, &c. Vigenere calls them **Gnomons**: the females of this species are called **Gnomides**.

Vignaul de Marville, in his *Melange de Histoire et de Literature*, tome i. p. 100, gives a relation of a conference with a philosopher of this class, who held, that an infinity of spirits inhabited each of the four elements, fire, air, water, and earth, under the denomination of *Salamanders*, *Sylphs*, *Oudins*, and *Gnomes*; that the **Gnomes** are employed in working or actuating the machines of brutes upon earth.

He added, that some philosophers of that sect held that these spirits were of two sexes, for the two sexes of brutes or moving machines; that they were more or less perfect as the brutes were; and that there was an infinite number of exceedingly small ones, to actuate the infinite number of insects and animalcula, both those that are visible, and those which are too small to come under our senses; that all these spirits, in general, govern their respective machines according to the disposition of the parts or organs, the humours, temperaments, &c. that they do not lay hold of all machines indifferently, but of those suited to their own character, element, &c. that a haughty one, for instance, seizes a Spanish gennet; a cruel one a tyger, &c.

**GNOME**, *Γνώμη*, or *gnôia*, is also used for a short, pithy, and sententious observation, reflection, or the like, which is worthy to be treasured up and remembered.

Such is that of Juvenal, "Orandum est, ut sit mens sana in corpore sano." The writers of rhetoric distinguish several kinds of gnomes, according as they turn on words, on actions, or both; denominating them *verbal*, *active*, and *mixed gnomes* or *gnôia*. See **APOPHTHEGM**.

**GNOMON**, in *Dialling*, is the style, pin, or cock of a dial, the shadow whereof pointeth out the hours.

The word is Greek, *γνώμων*, which literally imports somewhat that makes a thing known; because the style or pin indicates or makes the hour, &c. known.

The gnomon of every dial is supposed to represent the axis of the world; and therefore the two ends or extremities thereof must directly answer to the north and south poles. See **DIAL** and **DIALLING**.

**GNOMON**, in *Geometry*. If a parallelogram be divided into four lesser ones, by two lines intersecting each other, and one of these parallelograms be retrenched or taken away, the other three will make a gnomon, ordinarily called a *square*.

Or, a gnomon, in a parallelogram, may be said to be a figure formed of the two complements, together with either of the parallelograms about the diameter. Thus, in the parallelogram **A C**, *Plate VIII. Geometry, fig. 96*, the gnomon is  $M + x + z + N$ ; or  $M + N + X + Z$ .

**GNOMON**, in *Astronomy*, the name given to any upright pillar, when used for the purpose of determining the altitude of a celestial object, but particularly the sun.

The extreme simplicity of this instrument renders it very probable, that it was the first ever used for astronomical purposes. It fortunately happened for the science, that it was capable likewise of being a very exact one; and all the knowledge the ancients had of the solar theory seems to have been derived from this instrument. The principle of it is so simple, as hardly to require explanation. If the height of a vertical pillar be compared with its shadow on a horizontal plane, the altitude of the sun may be deduced by trigonometrical calculation, since these two quantities are to each other, as the tangent to the radius, or as the sine to the cosine of the altitude required. The ancient obelisks found in Egypt and the East were probably instruments of this kind: it would be too much to conclude that every one was erected for astronomical purposes, but this was probably their original destination; and the figure of an obelisk being rather pleasing to the imagination, it was adopted as an ornament to public squares and buildings. As practical astronomy advanced to accuracy and perfection, however, the gnomon appeared to be subject to considerable defects. The shadow is found to be generally ill defined, so that its length cannot be very accurately measured; and to obviate this, the gnomon must be of greater height than is easily practicable. In modern Europe, therefore, the original gnomon has been almost entirely abandoned, and a new one substituted upon principles nearly similar, but of a somewhat different construction.

The gnomons of modern Italy are usually constructed in very large edifices; a small aperture is made in the upper part of the building, which permits a luminous circular image of the sun to be formed on the pavement, on which a meridian line is accurately traced: a plumb line is suspended from the aperture to the floor, and thus both the height of the aperture, and the distance of the solar image from the point immediately beneath it, is very accurately ascertained.

There are upon record some very ancient observations made with instruments of this kind, particularly of Pythias, who observed the solstices at Marseilles above three centuries before the Christian era. Pliny mentions an obelisk erected by Augustus: this obelisk was brought from Egypt, and was said to have been made by Sesostris, near a thousand years before Christ. It was used by Manlius for the same purpose for which it was originally designed, namely, to measure the height of the sun.

The Chinese have from the earliest time been in the constant practice of making use of a gnomon.

In the year 1278, a gnomon 40 feet high was erected at Peking, by the Chinese emperor Co-chou King.

Ulugh Beigh, in the year 1437, observed the solstices at Samarcand by the shadow of a gnomon 165 feet high: and similar instruments are even said to have been used by the ancient inhabitants of Peru.

The gnomons to which modern astronomy is the most indebted, are chiefly those of France and Italy.

Paul Toscanelli constructed a gnomon in the cathedral of Florence, whose height was 280 feet. Niceres repaired this, and published an account of it in 1757.

Gaffendi constructed a gnomon of 50 feet in the "College d'Oratoire" at Marfeilles, and observed the solstices with it in 1636.

Ignatius Dante, in 1575, a Dominican friar, and afterwards bishop of Alatri, first constructed the celebrated gnomon in the church of St. Petronius, at Bologna: it was originally only about 70 feet high, but was raised by Cassini, in 1653, to the height of 90 feet, and it was with this that his valuable solar observations were made.

Most of these gnomons are accompanied by a meridian line, often highly ornamented with the names of the months and signs of the zodiac, so as to serve the purpose of a calendar. One of the finest in Italy is in the Carthusian convent at Rome, built on the ancient Thermæ of Diocletian. There are two, one to the north 62 feet, another on the south 75 feet high: they were constructed by Bianchini in 1721.

Picard erected a gnomon in the royal observatory at Paris, which still exists.

The meridian line in St. Sulpice, at Paris, was begun in 1727 by Sully, a watchmaker, and has since been much improved and highly ornamented: its height is 80 French feet.

M. de Cefaris and Reggio in 1786, constructed a gnomon and meridian line in the cathedral at Milan: its height is 73 feet.

The reason why none of these gnomons are to be found in England, is that we do not regulate our clocks by solar, but by mean time: to this may be added our unfavourable climate, which would very much diminish the interest which they obtain in other countries, where they are made to serve the useful purposes of civil life.

Notwithstanding the great attention that has been paid to the construction of these gnomons, their use has been entirely superseded by modern instruments of small dimensions, so that to the astronomer they are now become merely objects of curiosity: yet to no instrument has astronomy greater obligation. The solar theory was first brought to a very improved state by the use of this simple instrument alone. The length of the year, and the obliquity of the ecliptic, were determined by it with very great exactness. The ancient method of deducing the solar theory was nearly as follows.

To determine the obliquity of the ecliptic, the length of the shadows were observed at the period of the solstices, and the extreme points to which the longest and shortest shadows extended at the moment of noon were carefully observed, and the altitudes of the sun deduced at each of these periods: half the difference of the greatest and least altitudes would be the obliquity of the ecliptic, subject to a small error arising from refraction, the effects of which were not known at that early period, nor were they very considerable in those southern portions of the globe in which astronomy had its origin. But though it was not difficult to deduce the length of the solstitial shadows, it was by no means easy to determine the day on which either of the solstices actually happened, because the length of the shadow would appear to be the same at those seasons for several successive days. It appears, by some very ancient Chinese observations still on record, that this inconvenience was remedied by observing the length of the shadow, ten or twenty days before the solstice; then waiting till they found the meridian shadow again of the same length, they concluded that the moment of the solstice happened on the intermediate day between these corresponding observations.

The length of the year was determined from observations of the equinoxes, which could be much more exactly ob-

erved; for the obliquity of the ecliptic being determined by the method above described, the length of the equinoctial was known, and the day on which the shadow corresponded to the computed shadow was evidently the day of the equinox.

It was by examining a succession of these simple observations, that Hipparchus first discovered the great inequality in the length of the four seasons, arising from what is now called the equation of the orbit: and from the discovery of this important fact, we may date the origin of physical astronomy.

GNOMONIC COLUMN. See COLUMN.

GNOMONIC, *Polyhedron*. See POLYHEDRON.

GNOMONIC, or *Gnomonical projection*, that which represents the circles of a hemisphere, upon a plain touching it in the vertex, by lines or rays from the centre of the hemisphere to all the points of the circles to be projected.

In this projection, all the great circles of the sphere are projected into right lines. Any lesser circle parallel to the plane of projection is projected into a circle. And any lesser circle not parallel to the plane of projection, is projected into a conic section.

The gnomonic projection is also called the "horologigraphic projection," because it is the foundation of dialling. In other respects it is not much used, because the circles of the sphere are projected into conic sections, which are difficult to be described. However, this projection has its conveniences in the solution of some problems of the sphere, on account of the great circles being all projected into right lines.

Mr. Emerson, known by an ingenious Treatise upon Fluxions, and a variety of other publications, has given the theory and practice of the gnomonic projection, in his Treatise on the Projection of the Sphere, Lond. 1749, 8vo. See PROJECTION.

GNOMONICA, Γνωμωνική, or *Gnomonics*, the art of dialling, or of drawing sun and moon-dials, &c. on any given plane.

It is thus called, as it shews how to find the hour of the day, &c. by the shadow of a gnomon or style.

GNOSIMACHI, in *Ecclesiastical History*, an ancient sect in religion, whose distinguishing character was, that they were professed enemies of all studied knowledge in divinity.

The word is γνωσιμαχος, *q. d.* an enemy of wisdom or knowledge.

Damascenus says, that they were perfectly averse from all the gnoses of Christianity, *i. e.* all the science or technical knowledge thereof. They held it an useless labour to seek for gnosis in the holy scriptures; and said, that God requires nothing of men but good works; that it were, therefore, much better to walk with more simplicity, and not to be so solicitous about the dogmata of the gnostic life.

GNOSSUS, in *Ancient Geography*, a town of the island of Crete, more anciently called "Cæratius," from the name of the river which watered it. It was the fixed residence of Minos, once the capital of the island, and, according to Strabo, a wealthy and populous place, being 30 furlongs in compass, and full of inhabitants. This writer places it 20 furlongs from the Ægean or Archipelago, and 90 from the African sea. Its port, called Heraclium, was at a considerable distance, according to Olivier about four or five leagues to the eastward. Pausanias (*Attic.*) says, that it had a labyrinth. From this town Ariadne, so much celebrated by the poets, derived the name of Gnoſſis. When the island was reduced by the Romans, Gnoſſus was humbled, and Gortyna, her rival, raised upon her ruins. Somini says, that a small village, Gnoſſon, near Candia, would recal to mind the site of the ancient town, were it not discoverable, in a manner no

less certain than afflicting, from the rubbish which covers it, and a great part of which has served for the buildings of modern *Candis*, which see. See also CREED.

GNOSTICS, in *Eccelesiastical History*, ancient heretics, famous from the first rise of Christianity, principally in the East.

It appears from several passages of the sacred writings, particularly 1 John ii. 18. 1 Tim. vi. 20. and Col. ii. 8. that many persons were infected with the Gnostic heresy in the first century; though the sect did not render itself conspicuous, either for number or reputation, before the time of Adrian, when some writers erroneously date its rise.

The word is formed of the Latin *gnosticus*, and that of the Greek *γινωσκω*, *knowing*, of *γινωσκω*, *I know*.

The name Gnostic was adopted by those of this sect, as if they were the only persons who had the true knowledge of Christianity. Accordingly they looked on all the Christians as simple, ignorant, and barbarous persons, who explained and interpreted the sacred writings, in a too low, literal, and unedifying signification.

At first, the Gnostics were only the philosophers and wits of those times, who formed for themselves a peculiar system of theology, agreeable to the philosophy of Pythagoras and Plato; to which they accommodated all their interpretations of scripture. These enthusiastic and self-sufficient philosophers boasted of their being able to restore mankind to the knowledge (*gnosis*) of the true and Supreme Being which had been lost in the world. They also foretold the approaching defeat of the *evil principle*, to whom they attributed the creation of this globe, and declared, in the most pompous terms, the destruction of his associates, and the ruin of his empire. But

Gnostics afterwards became a general name, comprehending divers sects and parties of heretics, who rose in the first centuries, and who, though they differed among themselves as to circumstances, yet all agreed in some common principles. They were such as corrupted the doctrine of the gospel by a profane mixture of the tenets of the oriental philosophy, concerning the origin of evil and the creation of the world, with its divine truths.

It was one of the chief tenets of the philosophy of the Christian Gnostics, that rational souls were imprisoned in corrupt matter, contrary to the will of the Supreme Deity. In conformity to the opinion of the oriental sages, who expected an extraordinary messenger from the Most High, endowed with wisdom and invested with authority to communicate to miserable mortals just notions of the Supreme Being, and to deliver them from the chains of the tyrants and usurpers of this world, they believed, when Christ appeared and wrought miracles of the most astonishing and salutary kind, that he was the expected and wished-for messenger. Accordingly they imagined that he would rescue men from the power of the malignant genii, or spirits, to which, agreeably to their doctrine, the world was subjected, and so free their souls from the dominion of corrupt matter. Having admitted this supposition, they interpreted, or rather corrupted, all the precepts and doctrines of Christ and his apostles, in such a manner as to reconcile them with their own erroneous tenets.

Such were the Valentinians, Simonians, Carpocratians, Nicolaitans, &c.

GNOSTICS, a denomination sometimes also more particularly attributed to the successors of the first Nicolaitans and Carpocratians, in the second century, upon their laying aside the names of the first authors. Such as would be thoroughly acquainted with all their doctrines, reveries, and visions, may consult St. Irenæus, Tertullian, Clemens Alexandrinus, Origen, and St. Epiphanius; particularly the first of these

writers, who relate their sentiments at large, and confutes them at the same time: indeed, he dwells more expressly on the Valentinians than any other sort of Gnostics; but he shows the general principles whereon all their mistaken opinions were founded, and the method they followed in explaining scripture. He accuses them with introducing into religion certain vain and ridiculous genealogies, *i. e.* a kind of divine processions or emanations, which had no other foundation but in their own wild imagination.

In effect, the Gnostics confessed, that these æons or emanations were no where expressly delivered in the sacred writings; but insisted, at the same time, that Jesus Christ had intimated them in parables so such as could understand him. They built their theology not only on the gospels and the epistles of St. Paul, but also on the law of Moses and the prophets.

These last laws were peculiarly serviceable to them, on account of the allegories and allusions with which they abound; which are capable of different interpretations.

However, their doctrine, concerning the creation of the world by one or more inferior beings of an evil or imperfect nature, led them to deny the divine authority of the books of the Old Testament, which contradicted this idle fiction, and filled them with an abhorrence of Moses and the religion he taught; alleging, that he was actuated by the malignant author of this world, who consulted his own glory and authority, and not the real advantage of men. Their persuasion that evil resided in matter, as its centre and source, made them treat the body with contempt, discourage marriage, and reject the doctrine of the resurrection of the body and its re-union with the immortal spirit. Their notion, that malevolent genii presided in nature, and occasioned diseases and calamities, wars and desolations, induced them to apply themselves to the study of magic, in order to weaken the powers or suspend the influence of these malignant agents.

The Gnostics considered Jesus Christ as the Son of God, and, consequently, inferior to the Father, who came into the world for the rescue and happiness of miserable mortals, oppressed by matter and evil beings: but they rejected our Lord's humanity, on the principle that every thing corporeal is essentially and intrinsically evil; and, therefore, the greatest part of them denied the reality of his sufferings. They set a great value on the beginning of the gospel of St. John, where they fancied they saw a great deal of their æons or emanations under the *Word*, the *Life*, the *Light*, &c. They divided all nature into three kinds of beings, *viz.* *hylis*, or material; *psychic*, or animal; and *pneumatic*, or spiritual.

On the like principle they also distinguished three sorts of men; *material*, *animal*, and *spiritual*. The first, who were material, and incapable of knowledge, inevitably perished, both soul and body; the third, such as the Gnostics themselves pretended to be, were all certainly saved; the psychic, or animal, who were the middle between the other two, were capable either of being saved or damned, according to their good or evil actions.

With regard to their moral doctrines and conduct, they were much divided. The greatest part of this sect adopted very austere rules of life, recommended rigorous abstinence, and prescribed severe bodily mortifications, with a view of purifying and exalting the mind. However, some maintained, that there was no moral difference in human actions; and thus, confounding right with wrong, they gave a loose rein to all the passions, and asserted the innocence of following blindly all their motions, and of living by their tumultuous dictates. They supported their opinions and practice by various authorities: some referred to fictitious and apocryphal writings of Adam, Abraham, Zoroaster, Christ,

and his apostles; others boasted that they had deduced their sentiments from secret doctrines of Christ, concealed from the vulgar; others affirmed, that they arrived at superior degrees of wisdom by an innate vigour of mind; and others asserted, that they were instructed in these mysterious parts of theological science by Theudas, a disciple of St. Paul, and by Matthias, one of the friends of our Lord. The tenets of the ancient Gnostics were revived in Spain, in the fourth century, by a sect called the *Priscillianists*. (See Mosheim's *Ecc. Hist.* vol. i.)

The appellation Gnostic sometimes also occurs in a good sense, in the ancient ecclesiastical writers, and particularly in Clemens Alexandrinus, who, in the person of his Gnostic, describes the characters and qualities of a perfect Christian. This point he labours in the seventh book of his *Stromata*, where he shews, that none but the Gnostic, or learned person, has any true religion. He affirms, that were it possible for a knowledge of God to be separated from eternal salvation, the Gnostic would make no scruple to choose the knowledge; and that if God would promise him impunity in doing of any thing he has once spoken against, or offer him heaven on those terms, he would never alter a whit of his measures.

In this sense the father uses Gnostics, in opposition to the heretics of the same name; affirming, that the true Gnostic is grown old in the study of the holy scripture; and that he preserves the orthodox doctrine of the apostles, and of the church; whereas the false Gnostic abandons all the apostolical traditions, as imagining himself wiser than the apostles.

At length the name Gnostic, which originally was the most glorious, became infamous, by the idle opinions and dissolute lives of the persons who bore it; much as, in the present age, it has fared with the name *quietist*, *pietist*, &c.

GNU, in *Zoology*, a species of Antelope, having horns thick, rough, and bent much forwards at the base, then suddenly turned backwards, a ferruginous body, a neck with a mane, and a tail whitish. This animal inhabits the country of the great Namaquas, to the north of the Cape of Good Hope. It feeds in large flocks in the plains: is exceedingly fierce, very swift, and fights with its horns; it frequently drops on its knees, runs quickly in that posture, furrowing the ground with its horns and legs. It is a singular animal, having the body like a horse, with a thick bull-like head, elegant taper legs like a deer, and the lachrymal furrows of the Antelope tribe. It is about 6½ feet long, and 3¼ high at the shoulders; of a rusty brown colour, having its hair tipped with white, but on the breast and fore-legs long and black; the head is large and clumsy, with a square mouth and broad flaps over its nostrils; on the chin and gullet is a long hanging beard, or bunch of white hairs; the neck is short, thick, and somewhat arched, with an erect ash-coloured mane; the tail is long, white, and flowing like that of a horse; the feet have only one spurious hoof on each. The flesh is reckoned very good.

GO is sometimes used in *Law*, in a special signification. Thus, to *go without Jay*, and to *go to God*, denote as much as to be dismissed the court, and to be acquitted.

GOA, in *Geography*, an island in the East India sea, near the west coast of Hindoostan, separated from the continent by a river called "Mandova;" about eight leagues in circumference. The soil, especially in the vallies, is fertile; the trees are always covered with leaves, flowers, and fruit; and springs in abundance issue from the mountains. The rainy season continues here from June till September or October; and the land-floods bring down such quantities of mud and sand as stop up the haven and impede the

navigation. In the months of April and May the weather is sultry, but from October to March it is very moderate.

GOA, a city and capital of the Portuguese settlements in India, the seat of a viceroy, and see of an archbishop, taken by the Portuguese general Albuquerque in 1510 from a prince of Saracen extraction. The port of Goa is naturally, and still more by the improvements of the Portuguese, one of the best in India; it is fortified with many castles and towers, and furnished with abundance of good cannon. Beyond these castles the channel becomes narrow, straitening sometimes to one, sometimes to two miles, and its banks are planted with the best fruits and finest trees which India affords. Eight miles up the channel is the town of Goa. About the middle of this distance is a palace, now serving as a barrack for the garrison; and here begins a strong broad wall, two miles in length, which is a foot-walk when the country is overflowed, and in the vicinity of it a great quantity of salt is collected. This channel, which forms so excellent a port, runs many miles into the country, dividing it into several fruitful islands and peninsulas, which plentifully furnish the city with necessaries. Adjoining to this port is the haven of Marmugon, formed by the other channel, that runs between the island of Goa and peninsula of Salfete, and affords a safe retreat to the Portuguese and other ships, when they are shut out of the port by the sands which are brought down by the river Mandova, in consequence of the first rains of June, and till the passage is opened in October. This port of Marmugon is defended by a castle on the island of Salfete, and a good garrison. At the south entrance into the channel are the ruins of Old Goa; and from thence to the new city is a commodious road, elegantly adorned with trees for fruit and shade. The walls of the new city, which is decaying, include a space of 12 miles in circuit; and the public structures that remain sufficiently evince its former grandeur as well as extent. The number of inhabitants is said to be about 20,000; they consist of native Portuguese, Mellizos, and Canarians, or natives, who are black as jet, with long black hair, and fine features; here are also many negro slaves, and Pagans of different nations. As to the character of the inhabitants, the men are said to be, for the most part, proud, indolent, jealous, revengeful, and indigent; the women lazy, lascivious, and as well skilled in poisoning as any in the world;—215 miles S.S.E. from Bombay. The inquisition, formerly existing in this place, is now abolished. N. lat. 15° 28' 20". E. long. 73° 45' 45".

GOA, or *Goach*, a kingdom on the west and south-west coast of the island of Celebes, which, after various conflicts and revolutions, is now dependent on the kingdom of Boni. The capital of the same name stands on a little island, on the banks of a river, whence the kingdom derives its denomination. It was built about the same period as Samboupo and Tello; and was taken by the Dutch in 1778. S. lat. 5° 12'. E. long. 119° 51'.

GOACHO, a town of Peru, in the diocese of Lima, near the Pacific ocean; 65 miles N.N.W. of Lima. S. lat. 11°.

GOAD, in *Rural Economy*, a term applied to a pointed instrument, by which oxen are driven when employed in team-labour. It has frequently, likewise, a leather thong attached to the contrary end of it, so as to form a sort of whip.

GOAFFI, in *Geography*, a town of Africa, in the kingdom of Mandinga, on the Senegal.

GOAHIRO, a nation of South America, situated between the jurisdiction of Maracabo and the Rio, or river



de la Hache: they occupy the coast for more than 30 leagues, and extend equally far into the interior part of the country. They have at all times been considered as the most ferocious of the maritime Indians. The Spaniards never even attempted to conquer them. Some missionaries have made efforts for instructing and proselyting them to the Christian faith, but without any permanent effect. Their number amounts to 30,000. They are governed by a cazique, for whom they have erected a citadel upon a small eminence, called "La Teta," the Pap; at the distance of some leagues from the sea. They breed horses upon which they ride with incredible rapidity. Their troops are all mounted, each soldier carrying a carbine, cartridge-box, bow and quiver. They experience much friendship from the English of Jamaica. They assist them with advice, and supply them with arms. These marauders have rarely any communication with Maracaibo, because, as its jurisdiction is the principal scene of their robberies and atrocities, the inhabitants are obliged to be continually on their guard, so as to be always ready to repel the aggressions of such troublesome neighbours. The Spanish city to which they chiefly resort is Rio-de-la-Hache, depending upon the vice-royalty of Santa Fe, where they barter their commodities. They set out in bands, most commonly preceded by their wives, who carry their children upon their backs, besides other loads, too heavy even for beasts of burden. Dreading imposition, they have never adopted the use of specie, but barter their horses and oxen chiefly for spirituous liquors, to the use of which they are much addicted. Urged by their necessities they recur to arms, and threaten the nearest city or village. After some hostilities, the Spaniards sue for peace, and obtain it in consideration of some pipes of brandy and other smaller articles. Although these Indians are well received in the Spanish cities, they will not admit any Spaniard into their country; and yet some Spanish smugglers contrive, for pecuniary considerations, to obtain a passport and escort for traversing the country of the Goahiros, and they have thus acquired many partizans among the Spaniards themselves; but their principal and most useful connection is formed with the English of Jamaica. By them they are supplied, not only with arms and ammunition, but with the stuffs that clothe them. Their dress is ornamented by a great variety of feathers, fragments of shining metals, and gold ridiculously fixed to their ears, nose, and arms. The articles with which they furnish the English in exchange for the merchandize they receive are pearls, which they fish in their own ports, and horses, mules, and oxen. Their ferocity is such, that even the English will seldom so far confide in them as to venture on shore, but the business of bartering is transacted on board, and the ships hasten to depart. The ships that are accidentally cast upon the coast, immediately become the prey of these cannibals, who massacre the crew and devour their flesh; dividing the cargo among those who are present on the occasion. The Goahiros are said to be a formidable nation, well mounted, armed, and disciplined; and able to bring into the field 40,000 effective men.

On the eastern part of the territory of the Goahiros are the "Cocinas" Indians, who live like savages, but are so cowardly and pusillanimous as to allow the Goahiros to exercise an authority, which the bold always acquire over the timid. These savages are, in fact, merely the slaves of other savages. Depons's travels, vol. i.

GOAL. See GAOL.

GOAL-PARAH, in *Geography*, a town of Hindoostan, in Bengal, situated on the Burhampooter, and on the borders of Assam; where the Europeans have factories, who carry

on a considerable trade with Assam, Booter, Tibet, &c.; 32 miles E. of Rangamatty.

GOAN, the name of a Persian tree, of the seeds of which they make a sort of antispodoric, or medicinal powder, for diseases of the eyes.

GOANAGOODY, in *Geography*, a town of Hindoostan, in Marawar; 8 miles E. of Tripalore.

GOANDA, a naked, savage and ferocious race, who inhabit the extensive and unexplored wilderness, E. of Nagpore, in Hindoostan, which is pervaded by the great river Baim, or Baun Gouga, and terminates in the mountains bounding the English circars.

GOAR, Str. a town of France, in the department of the Rhone and Mofelle, and chief place of a canton, in the district of Simmern, situated on the west side of the Rhine, in which there is, near this place, a water-fall; 16 miles S. of Coblenz. N. lat. 50° 8'. E. long. 7° 43'.

GOAN-*Vetch*, a name sometimes applied to the fumaria vetch. See TAKE and VETCH.

GOARING, on *Ship-board*. The strain by a sail is cut *goaring*, when it is cut sloping by degrees, and is broader at the clew than at the ear-ring, as all top-sails and top-gallant-sails are.

GOAS, in *Geography*, a town of Bengal; 11 miles E. of Moorshedabad.

GOAT, in *Zoology*. See CAPRA.

GOAT, in *Rural Economy*, is an animal, that in particular situations may be kept with advantage by the farmer, as where the country is rocky and barren, and there is but little keep for any other sort of animal. The goat is capable of climbing the steepest rocks, and of browsing upon the briers, heath, and shrubs of several different kinds, which are rejected by other sorts of animals. When turned into pasture grounds they should consequently be prevented from nipping the young shoots of trees and other woods, as they prefer them to the grass.

They are beneficial in several different points of view, as in their milk, which they afford plentifully, and which is of a very excellent quality. In some cases, this and cow's milk are mixed together, and a highly valuable cheese prepared from them.

The young kids are likewise very excellent food, and two or three are frequently brought forth at a time, often twice in the course of the year.

The hair of the goat is also very valuable for different purposes, as the making of ropes to be used in the water, which are extremely durable. A sort of stuff is also formed from it in some places. It may be sheared in the same manner as wool from the sheep.

The suet of the goat is excellent, the animals being in some places, as in Caernarvonshire, killed merely for the object of their suet; which is capable of being made into candles of a superior quality to those of the common kind.

Their horns constitute valuable handles for tacks and pen-knives. The skin of the young kid is well suited to the glove manufactory, from its taking on a dye better than any other sort of skin. The old skin is highly useful also, being in many cases preferred to that of the sheep; besides, the fish affords a cheap and abundant food for the winter months, especially when the kids have been sent early to market. The haunches of the goat are often salted and dried, and supply all the uses of bacon; and are known by the Welch under the name *cash pr walen*, or being venison.

In choosing goats for keeping, the following directions

should be attended to. The male should have a large body, with long hair, and straight stiff legs, the neck should be plain and short, the head small and slender, the horns large, the eyes prominent, and the beard long.

The female ought to have a large udder with well sized teats, and with none or very small horns.

Goats are best kept in flocks, in order that they may have the less disposition to straggle; and they should have good shelter both for summer and winter, great heat and cold being equally injurious to them.

The period of coupling them is about December.

They are mostly kept without litter in the winter season, in clean paved yards or other places.

The kids may be prepared for the table in a manner similar in some degree to that of the lamb.

They have been vulgarly supposed useful in stables from the disagreeable odour that issues from the males at particular seasons, but there are probably no real grounds for such a conclusion.

*GOAT-fish*, *Caprifiscus*, in *Ichthyography*, the name of a fish, called also by some *caper*. It is a species of *BALLISTES*. In the middle of its back it has three very strong and large prickles, the first of which is three times as large as any of the others, and all are connected by a membrane.

The whole fish is covered with a scaly skin; but the scales have more the appearance of those of a serpent than those of the fish; for they are placed in cancellated lines intersecting one another, and are so well fixed, that they with difficulty come off; and wood or ivory may be polished with the skin, as with the common fish-skin used by the turners, &c. It is of a blueish-green colour, spotted with a fine blue, and the back and belly fins are black, with some blue and red spots. Its whole figure is very broad and flat, as well as short, so that it approaches to a round form. It seldom exceeds two pounds in weight. It is caught in the Mediterranean, but not commonly. The skin of it is frequently found in the cabinets of the curious.

*GOAT Islands*, in *Geography*, two small islands near the S. coast of Jamaica, they are denominated *Great* and *Little*; the former is situated in N. lat. 17° 53'. E. long. 76° 51'; and the latter about a mile N. W. from it.

*GOAT Island*, the southernmost of the *Bashee* islands, in the East Indian sea. N. lat. 20° 6'. E. long. 121°.—Also, a small island among the *Philippines*, near the S. W. coast of *Luçon*. N. lat. 13° 52'. E. long. 120° 13'.—Also, a small islet of *America*, in the state of *Rhode* island, opposite to the town of *Newport*, and on which is *Fort Washington*.

*GOAT'S Beard*, in *Botany*. See *TRAGOPOGON*.

*GOAT'S Eye*, in *Surgery*. See *EYE*.

*GOAT'S Horns*, *petrified*. In *Dr. Grew's "Rarities of Gresham College,"* p. 257, a *Tephritis bætii*, or goat's horn, in that collection, is described as broken at both ends, about six inches long, and 2½ inches across at the broadest part, the belly an inch over and furrowed, the back somewhat edged, of an ashen colour, inwardly blueish grey, outwardly mixed with oblique and white streaks, bended, one end thicker than the other: it is added, that such are found in *Germany*, *Moravia*, *Silesia* and other parts, and effervesce with *nitric acid*.

In the *Analysis of the Labours of the French national Institute for 1809*, it is mentioned that *M. Cuvier* in the alluvial soils near *Etampes* had discovered horns, some of which do not seem to differ essentially from the horns of the existing species of goats. The evidence in neither of

the above cases, or any other which we have seen, is sufficiently strong to prove the fossil horns of this class to have really belonged to goats: and analogy would justify us rather, in referring them to the extinct race of animals, fish, and vegetables with which the strata are so abundantly stored, in some parts of the series.

*GOAT'S Rue*. See *GALEGA*.

*GOAT, Scape*. See *SCAPE-GOAT*.

*GOAT'S Sucker*. See *CAPRIMULGUS*.

*GOAT'S Stones, greater*. See *SATYRIUM*.

*GOAT'S Stones, lesser*. See *ORCHIS*.

*GOAT'S Thorn*. See *ASTRACALUS*.

*GOATFIELD*, in *Geography*, a mountain of *Scotland*, in the island of *Arran*; the summit of which is 2845 feet above the level of the sea.

*GOAVE, GRAND*, a town of the island of *Hispaniola*; 10 miles S.W. of *Leogane*.

*GOAVE, Petit*, a sea-port town of the island of *Hispaniola*, with a harbour capable of receiving vessels of the largest size safe from winds; in its environs are plantations of sugar, coffee, indigo, and cotton. The town is the emporium to which the inhabitants of *Grand Goave*, and other places, send their commodities; 20 miles W.S.W. of *Leogane*. N. lat. 18° 26'. W. long. 73° 37'.

*GOBAN*, a town of *Persia*, in the province of *Chufistan*; 75 miles S. of *Sufter*.

*GOBAN*, or *Goban*, a small island in the mouth of the *Euphrates*, or *Shat el Arab*, at the entrance into the gulf of *Persia*, with a town upon it; 50 miles E.S.E. of *Bassora*. N. lat. 30° 10'. E. long. 48° 25'.

*GOBANNIUM*, in *Ancient Geography*, a town of *Britain*, placed in *Antonine's Itinerary* between *Barrum* or *Ulk*, and *Magnis* or *Kenehesler*, 12 miles from the former and 22 from the latter, and supposed to be *Abergavenny*, which see.

*GOBBI*, in *Geography*, a country of *Africa*, between that of *Camma*, and *cape Lopez Gonfalvo*; the chief trade of which consists in elephants and ivory. The chief town is about a day's journey distant from the Atlantic. N. lat. 1° 30'. See *CAMMA*.

*GOBBINS*, in *Mining*, is a name with the colliers of several districts for the hole-ing stuff and other refuse of their works; as also for the hollows or spaces behind them, into which they throw the refuse coal, earth, and stones; which last are also called *wastes* and *old-hollows*.

In the coal-pits about *Wednesbury* in *Staffordshire*, and at *Donilthorp*, *Danby-Hall*, &c. in *Derbyshire*, the gobbins take fire spontaneously after some time, unless the air is excluded from them, owing to duns, tow, tawe or cat-dirt, a thin stratum found near the coal, which heats, swells, and spontaneously inflames, by the contact of air and moisture. At *Donilthorp* they encase their gobbins in walls of tempered clay at certain distances, for excluding the air.

*GOBBS*, otherwise *Cobbles*, are pieces of coal from the size of walnuts to that of a man's fist or larger, which are occasionally picked or raked out of the leek or refuse-small coals at the collieries, either by poor persons, who are allowed to do so, or for sale. These are what in *London*, and many places in the east and south of *England*, would be called *round-coals* and highly valued, on account of the absence of very small or dust coals among them. Where the rage among the buyers and dealers is for *large coals*, as about *Wednesbury* in *Staffordshire*, and the *Erewash* vale in *Derbyshire* and *Nottinghamshire*, an inconceivable waste is made of cobbles and leek; in working the thick coal about *Wednesbury* a heap of such, six or seven yards thick, is laid to be left and walked on the floor of their works:

and

and to occasion a further waste of a rib or wall of solid coal, round each stall or chamber, for excluding the air, which would otherwise fire these waste heaps. See **GOBBINS**.

**GOBELINS**, a celebrated manufactory, established at Paris, in the Fauxbourg St. Marcel, for the making of tapestry, and other furniture for the use of the crown. The house where this manufactory is carried on was built by two brothers, Giles and John Gobelins, both excellent dyers; and the first that brought to Paris, in the reign of Francis I. the secret of dyeing that beautiful scarlet colour still known by their name; as well as the little river Bievre, on whose banks they fixed their dye-house; and which is now known by no other name than that of the river of the Gobelins.

It was in the year 1667 that this place, till then called "Gobelins' Folly," changed its name into that of "Hotel Royal des Gobelins," in consequence of an edict of Louis XIV. Monf. Colbert having re-established, and with new magnificence enriched and completed the king's palaces, particularly the Louvre and Thuilleries, began to think of making furniture suitable to the grandeur of those buildings: with this view he called together all the ablest workmen in the divers arts and manufactures throughout the kingdom; particularly painters, tapestry-makers, sculptors, goldsmiths, ebonists, &c. and by splendid offers, pensions, privileges, &c. called others from foreign nations.

And to render the intended establishment firm and lasting, he brought the king to purchase the Gobelins, for them to work in, and draw up a system of laws, or policy, in seventeen articles.

By these it is provided, that the new manufactory shall be under the administration of the superintendent of the king's buildings, arts, &c. that the ordinary masters thereof shall take cognizance of all actions and processes brought against any of the persons in the said manufactory, their servants and dependants; that no other tapestry work shall be imported from any other country, &c.

The Gobelins has ever since remained the first manufactory of this kind in the world. The quantity of the finest and noblest works that have been produced by it, and the number of the best workmen bred up therein, are incredible; and the present flourishing condition of the arts and manufactures of France is, in a great measure, owing thereto.

Tapestry work, in particular, is their glory. During the superintendance of M. Colbert, and his successor M. de Louvois, the making of tapestry is said to have been practised to a degree of perfection, scarce inferior to what was before done by the English and French.

The battles of Alexander, the four seasons, four elements, the king's palaces, and a series of the principal actions of the life of Louis XIV. from the time of his marriage to the first conquest of Franche Comté, done from the designs of M. Le Brun, director of the manufactory of the Gobelins, are master-pieces in their kind.

**GOBEMOUCH**, the *fly-catcher lizard*, a species of American lizard that is always employed in catching of flies. It is the smallest of all the lizard kind, and is very beautiful, its skin often appearing as if covered with leaf-gold, or leaf-silver, and in some others of a green, or red and gold, wonderfully bright and beautiful. They are not at all shy or fearful of men, but as they do not hurt, so they seem to dread none; they enter chambers and closets, and do no sort of damage, but destroy the flies and other troublesome ver-

min they find there. Their whole lives seem spent in the chase of these insects, and it is a very pleasing thing to observe the various ways they have of catching them. They are very cleanly creatures, and may be suffered to run over the table at meal time; where, if they see a fly, they will pursue it over the very hands or cloath of people, or over the dishes, without doing the least hurt.

Notwithstanding their great beauty while alive, they are only of a dusky grey when dead, all their other colours, immediately vanishing.

**GOBE-MOUCHE**, in *Ornithology*, a name given by Buffon to several species of *Lanius*, *Turdus*, *Muscicapra*, and *Motacilla*, which see respectively.

**GOBIN, Str.**, in *Geography*, a town of France, in the department of the Aisne; celebrated for its manufacture of plate-glass; 4 miles S. of la Fere. See **GLASS**.

**GOBIO**, in *Ichthyology*, a species of *Coccus*; and also of *Cyprinus*; which see respectively.

**GOBIUS**, a genus of the thoracic order, possessing, according to Linnæus, the following essential character. Head small, eyes approximated, with two punctures between; gill-membrane four-rayed; body small, compressed on each side, covered with small scales, and furnished with a small tubercle behind the vent; the vertical fins united into an oval or funnel shape; and the dorsal fins two in number.

At the time Linnæus wrote his *Systema Naturæ*, the above character was probably found sufficiently explicit to embrace, in a correct and lucid order, all the species of this natural tribe of fishes at that period known. This, however, it may be confessed, is not precisely the case at present. The number of species has been materially augmented by the recent discoveries of naturalists, and among these are certain kinds which exhibit differences essentially dissimilar from each other; though still, in the idea of the Linnæan student, they can be only referable to the genus *Gobius*; while others, no less intimately allied, cannot, without a palpable innovation on the order of nature, be confined to that genus. The later French writers, as Latreille, Bosc and others, after the example of Lacépède, divide the Linnæan *Gobii*, and their natural affinities, into four distinct genera, namely, *Gobius*, *Gobioides*, *Gobiomorus*, and *Gobiomoroides*, an extension perhaps requisite, or at least admissible. This extension is indeed, in our own opinion, rather desirable, and we refrain from adopting it only to avoid that degree of perplexity which might probably result from the dispersion of the species into the several distinct articles, which would then become necessary. For this reason, we propose to concentrate the whole in one point of view, observing only to refer the species respectively to their different genera as we proceed, and by this means leave it to the judgment of the reader, whether those recently established genera ought to be in reality considered essentially distinct, or as only constituting the natural subdivisions of the Linnæan genus *Gobius*.

The habits of these fishes in general appear to correspond; they are chiefly inhabitants of waters contiguous to the shores, and lie concealed among the rocks, under stones, or in the sand and mud of seas and rivers; they feed on worms, insects, and the spawn and fry of fishes; and adhere firmly to the rocks or other hard substances by means of their ventral fins.

#### Species

Genus *Gobius* — *Ventral fins united; dorsal fins 4*  
 Section. *Pectoral fins attached to the body.*  
**BODACURRI.** Rays of the dorsal fin cartilaginous, the third very long. Pallas.

A native of the Indian seas, in common about six inches in length, and never exceeding eleven or twelve inches. The head thick, blunt, and somewhat convex, with spots of brown and white; crown convex, and gradually sloping down; jaws of nearly equal length; lips thick and fleshy; eyes vertical and oblong; gill-membrane livid. The body is rather convex, tapering slightly towards the tail, and covered with small and soft scales; the colour blueish brown above, beneath pale yellow, inclining to whitish; the back marked with a longitudinal series of seven brown spots, beneath which, on the sides, are seven other spots of the same colour, but these latter are speckled with white; the vent, which is situated rather nearer the head, is surrounded by a black circle, behind which is a conic peduncle. The dorsal fins are blueish black, the first including five rays, has the membrane spotted with white; the membrane of the second is remarkable in having six white lines between each ray, these rays are fetaceous, and amount to twenty-five in number; the pectoral fin is roundish, and includes twenty-one rays; ventral, thirty-four; anal, twenty-five; and the tail, which is blueish white, eighteen rays.

**LAGOCEPHALUS.** Upper jaw hemispherical; no tongue and lateral line. Pallas.

The native place of this species is uncertain; it was first described by Kolreuter, in the Transactions of the Royal Academy of Peterburgh, and afterwards by Pallas in his "Spicilegia Zoologica." The head is short, thick, and destitute of scales, the mouth transverse; eyes distant, small, and covered with a common skin; upper jaw very thick, the lower with a few larger teeth, which are a little hooked; the lips cleft in the middle, doubled, the upper fleshy and very thick, and also reaching much beyond the jaw; palate with numerous crowded teeth of small size on the margin. The body round, compressed towards the tail, of a grey or brown colour, and covered with minute scales; vent in the middle of the body. The first dorsal fin contains six rays of a simple form, the rays in the second fin, like those of the tail, are branched, and amount in number to eleven; the pectoral fin lanceolate oval, with fifteen rays; ventral, with eight short crowded rays; anal, ten rays; and caudal, twelve. The total length of this fish about three or four inches.

**CYPRINOIDES.** Body covered with large sub-ciliated scales; tail rounded; the membrane connecting the rays testellate with brown. Pallas.

About the size of a finger, the body of a compressed form, thickish, convex, grey brown above, beneath whitish; skin soft and cancellated with fine lines; teeth minute and nearly equal; tongue flat, soft, and obtuse; eyes lateral and between them a blackish semi-lanceolate crest; rays of the fins mostly branched; lateral line obsolete. The species inhabits Anboina.

**LANCEOLATUS.** Tail very long and acutely pointed. Bloch. *Gobius oceanicus*, Pallas.

Inhabits the brooks and rivers of Martinico, where Plumier saw it in great abundance. The body is oblong, and covered with round imbricated scales, which are larger on the posterior part. The head is long and truncated; the eyes vertical with black pupil, and golden iris; jaws equal; tongue loose and acute; cheeks blueish edged with red; lateral line in the middle of the body, and the vent nearer the head; dorsal and anal fins with simple, soft, distant rays, connected by a thin membrane; rays of the first dorsal membrane extended far beyond the membrane; between the dorsal fins on each side a brown spot; pectoral fin yellow edged with blue; tail at the base greenish yellow, the edge violet. The flesh excellent.

**MINUTUS.** Whitish, spotted with ferruginous; rays of the dorsal and caudal fins obscurely streaked with the latter. *Donov. Gobius minutus; albicans ferrugineo-maculatus, radiis dorsalibus, et caudalibus ferrugineo obsolete striatis, Pallas. Minute or spotted goby, Pennant.*

"The minute or spotted goby is a pretty, delicate, little creature, whose usual length very rarely exceeds two inches and a half, or at the utmost three inches. Pallas, who describes this species, defines its character with much precision; he speaks especially of the obsolete streaks across the rays of the two dorsal fins and tail, which are sufficiently distinct, except when the fins happen to be considerably expanded, at which time they indeed appear as so many series of unconnected dots. These streaks or dots are uniformly constant in all the specimens of the fish that have fallen under our observation, varying a trifle only in the tint or density of colour.

"Bloch does not include this species in either of his works on fishes. Pennant considers it as the *Gobius aphyia* of Linnæus, in which particular later writers are mistaken; it must however be confessed, that there still remains some little doubt as to the precise difference between the *aphya* and *minutus*; Linnæus tells us the former has the body and fins barred with brown, and this will, in a certain degree, apply to the characters of *minutus*. That the spotted goby is the *minutus* of Pallas cannot admit of doubt.

"It has been imagined, on the authority of Mr. Pennant, that the spotted goby appeared on our coasts only during the summer months, and was besides extremely local. This idea is certainly unfounded, for we have received them from various parts of the sea-coast in all seasons of the year. In the wide sweep of sands, called Traeth Levan, which extends along the south-side of Beaumaris bay; upon the shores of the Severn; and also many other of our sandy coasts, this diminutive fish has attracted our remark swimming or lurking among the shrimps in the shallow pools left by the sea at ebb-tide. The same species is likewise not unfrequently captured with the sprats, at a short distance from the shore.

"In the first dorsal fin are six rays, in the second eleven; the pectoral fin contains twenty rays; the ventral, nineteen; anal, eleven; and tail sixteen."

We have been the more explicit in detailing the character and history of the spotted goby, in order to enable the reader to comprehend the precise difference between this and the following species.

**APHYA.** Body and fins barred with brown. Linn. Mus. Ad. Fr. *Gobius uncialis, pinna dorsi secunda officulorum 17, Art*

Described as a very small species found in the Nile and some parts of the Mediterranean; the length about an inch. The first dorsal fin, as in *minutus*, contains six rays, the second sixteen or seventeen; pectoral, according to Linnæus, eighteen, or one less, as Artedi mentions. Linnæus states the number of rays in the ventral fin at twelve, Artedi at only six, and in describing those of the anal fin they differ again, these being, as Artedi informs us, no more than eleven, though Linnæus says they amount in number to no less than fourteen.

Jozo. Rays of the dorsal fin setaceous, and extending above the membrane. Linn. Jozo, Salv. *Gobius albus*, Ron-del. *Gobius tertius*, Will.

This is an inhabitant of the European and Mediterranean seas; its length is from four to six inches; the body above brown, beneath whitish, and the whole covered with scales. The head is compressed; pupil of the eye black with the iris white; the back slightly arched; jaws of equal length, and armed with numerous small teeth; the lateral line straight,

## GOBIUS.

straight, blackish, and placed in the middle of the body. The colour of the fins, which is blue, constitutes, according to Bloch, the characteristic distinction of this particular species. Its haunts are the sandy shores of the sea, and its food testaceous animals, crabs, and other marine creatures. Though highly prolific, it is observed not to multiply very fast, its eggs being eagerly fought after by the larger kinds of fishes. The flesh is indifferent, being hard and meagre.

**ELEOTRIS.** Anal fin with nine rays; tail roundish. Lagerstroëm. *Gobius Chinenfis*, Osbeck.

Whitish, covered with large, round, and smooth scales, and marked on the back near the gill-covers with an ample violet spot; both the dorsal fins of equal height, the first containing six rays, the second eleven; pectoral fin twenty; ventral, ten; anal, nine; and tail ten. The species inhabits China.

**PECTINIROSTRIS.** Teeth in the lower jaw horizontal. Gmel.—Lagerstr. *Apocryptes Chinenfis*, Osbeck.

A fish of small size found in China: the first dorsal fin contains five rays, the second twenty-six; pectoral, nineteen; ventral, twelve; anal, twenty-five; and caudal, fifteen.

**BICOLOR.** Fuscous; all the fins black. Linn.—Brünn pisc.

Length from three to four, or rarely exceeding six inches, and inhabits the Mediterranean sea. The rays of the fins project very inconsiderably above the connecting membrane.

**CRUENTATUS.** Mouth pustulate with red; rays of the dorsal fins reaching above the membrane. Brünn.

About a span in length, the mouth, gill-covers, chin, and fins pustulate with sanguineous red spots; beneath the eyes a transverse membranaceous line, and two others placed longitudinally before the dorsal fin; fins generally brownish, with setaceous rays; pectoral rounded; ventral blueish, with the rays split at the end; tail pointed and slightly banded with black. Gmelin is inclined to think this may be only a variety of the species Jozo.

**PAGANELLUS.** Tail and second dorsal fin purplish at the base; the first dorsal fin edged with a yellowish line. Linn. *Gobius paganellus*, Hasselquist.

Length three, four, or six inches; the body slightly compressed and whitish, with a green tinge, and marked with blackish dots or small spots. Native of the Mediterranean.

**ARABICUS.** Five posterior rays of the first dorsal fin terminating in a red filament twice the length of the membrane. Forst.

Native of Djidda in Arabia. The body is about the size of the little finger, and of a greenish-brown colour, with numerous confluent violet spots and specks of blue; skin soft and covered with minute firm scales; fins spotted; tail cuneated.

**NEBULOSUS.** Second ray of the first dorsal fin ending in a black filament twice as long as the body. Forst.

Inhabits the same sea as the former, and nearly the same size; body whitish, with brown clouded confluent spots, beneath white without spots; scales rhombic and rigid; pectoral fins glaucous, with obsolete brown spots at the base; ventral brownish; dorsal fin and tail transparent, dotted with brown; anal fin hyaline, with the outer edge black.

**PLUMIERI.** Upper jaw prominent. Bloch.

This, according to Plumier, inhabits the rivers of the Antilles in great numbers, and is in much esteem for the table, its flesh being of good flavour, and very wholesome. The body is round, fleshy, above tawny, yellow on the sides and white beneath; the whole covered with small scales; head large; vent in the middle of the body; lateral line straight;

fins yellow; pectoral and caudal yellow at the edge, with branched rays; dorsal and anal with simple rays.

**OCELLATUS.** Upper jaw longer; first dorsal fin six-rayed, with a black ocellated spot near the base on the posterior part. Broussonet.

Found in the fresh waters of Otaheite. The head is rather compressed, sub-conic, blackish, above slightly curved, obtusely carinated in the middle; teeth unequal, and minute, those of the lower jaw smaller; body compressed, lanceolate, covered on the posterior part with imbricated, ciliated scales, and obscurely clouded with olive and black; beneath glaucous.

**NIGER.** Blackish varied, second dorsal fin with about fourteen rays. Artedi. *Gobius niger*, Donov. Brit. Fishes. *Apocryptes Cantonensis*, Osbeck. *Blackgoby*.

Native of the European and Asiatic seas. Length six inches; colour blueish black, varied.

**BOSCH.** Body and tail grey, speckled with brown; the former marked with seven transverse whitish bands. Lacépède.

Described and figured in the work of Lacépède, on the authority of Bose, who observed it on the coasts of North America; it grows to the length of four inches; the head is broader than the body; the first four rays of the anterior dorsal fin terminate in a filament; and the body, which is smooth, is apparently without scales. The flesh is never eaten.

**CÆRULEUS.** Body blue; caudal fin red, with black border. Lacépède.

Inhabits the seas on the eastern coasts of Africa, where it was observed by Commerçon, who describes its appearance in the water, when the sun shines, as splendid in the highest degree, though its size is small, the total length not exceeding three inches. The first dorsal is somewhat triangular, with the rays terminating in filaments, the second contains fourteen rays, the filamentous appendice of the last ray in which is thrice the length of the rest. The flesh is not eaten by the natives, but is used as bait in fishing.

\*\* Section. *Pectoral fins attached or placed on a fleshy process or elongation.*

**SCHLOSSERI.** Blackish-brown, beneath whitish; rays of the first dorsal fin spinous. Pallis. *Schlosserian goby*.

This is about a span in length, the body, rather compressed, decreasing in an inconsiderable degree towards the tail, and covered with large round coriaceous scales; the head long, much thicker than the body, and sloping in front; the mouth transverse; lips thick, fleshy, granulous within, and the upper one folded; teeth large, unequal, distant, and irregularly alternate; palate fleshy; tongue thick, soft, and fleshy; the eyes vertical and placed forward, protuberant, the pupils turned to the sides with a large lunate cavity beneath each; gill-covers oblong and scaly; tail ovate-acute; and the vent in the middle of the body. In the first dorsal fin are eight rays, in the second thirteen; pectoral, sixteen; ventral, twelve; anal, twelve; and tail nineteen. The species inhabits the fresh waters in the island of Amboina, generally residing in the soft mud at the bottom, and subsisting on worms; the flesh is excellent. The same fish occurs also in many parts of China. In the Gmelinian Syst. Nat. the species is described under two distinct names, *schlosseri* and *barbatus*, the latter of which Linnaeus defines as having the pectoral fins fan-shaped, and the first dorsal fin with twelve rays, the second thirteen. Lacépède, Boie, and other late writers agree in considering them the same.

### Genus *Gobioides*.

Ventral fins united; dorsal fin one; head small; gill-covers closed nearly throughout their contour.

**MELANURUS**

**MELANURUS.** Dorsal fin single; tail black. Gmel. *Le gobioidé queue noire*, Brouff. *Black tailed goby*.

Described by Gmelin on the authority of Brouffonnet's Ichth. dec. 1.; it is mentioned as a small species, the habitat of which is unknown. Bosc believes it was brought from the South sea.

**AMGUILLARIS.** Dorsal fin single; tail red. Gmel.

The general figure of this species is somewhat anguilliform, or shaped like an eel, and like that fish the body is fat and slippery; the teeth are small, and project out of the mouth; the dorsal and anal fin are large, and extend to the tail, with the fin of which they are united; the colour of the body is pale brown, of the fins red; the first dorsal fin includes fifty-two rays; the pectoral, twelve; ventral, ten; anal, forty-three; and tail twelve. The fish is a native of the coast of China and other parts of India.

**SMYRNEENSIS.** Edge of the jaws formed of a bony plate, and destitute of teeth. Lacépede.

Described on the authority of the new memoirs of the Transactions of the Academy of Peterburg. It is a native of the Mediterranean; the skin very viscous, and the dorsal fin furnished with forty-three rays.

**BROUSSONETTI.** Body very long and compressed; tail elongated. Lacépede.

Supposed to be a native of the Indian seas. The example described by Lacépede appertained to the Stadtholder's museum. The dorsal fin contains thirty-three rays, and extends nearly to the tail, as does likewise the anal fin; the body nearly transparent, and the jaws furnished with small teeth.

#### Genus *Gobiomorus*.

Head small; eyes approximated; gill-covers closed nearly throughout their contour; dorsal fins two.

\* Section. *Pectoral fins connected close to the body.*

**STRIGATUS.** Ventral fin divided; first caudal fin six-rayed. Brouffonnet.

Native of the Pacific ocean, near Otahitee. The head is compressed, yellow, streaked and spotted, and greenish yellow above; body compressed, lanceolate and covered with imbricated, subquadrated, and slightly crenated scales; colour pale blueish-green; beneath whitish, with brownish streaks behind the pectoral fins; beneath the lateral, on the hind part, varied with obsolete reddish spots; first dorsal fin green, with red rays and four fillets of the latter colour; the second dorsal fin with nine red fillets; pectoral fin pale greenish, the marginal rays shorter and simple; ventral whitish; anal long, greenish-red; tail round-oval, yellowish-green, the rays red and simple, with a broad oblique, slightly curved reddish fillet each side.

**DORMITOR.** Upper jaw longest; tail rounded. Lacépede.

Described from the drawing of Plumier, who saw it in the fresh waters and rivers in the marshes of South America. The second dorsal fin contains eleven rays, and each of the pectoral fins eight.

**GRONOVII.** Ventral fins divided; first dorsal fin ten-rayed; tail forked. Gmel. *Cestus argenteus*, &c. Klein. *Maçil Americanus*, Ray. *Harder*, Marcgr.

Inhabits the seas of South America. The body is silvery above, black, and spotted on the sides with black; scales small and imbricated. The head of this species is naked; eyes large and lateral; mouth narrow; teeth equal, in the jaws and palate; tongue rounded, thin, smooth; gill-covers smooth and roundish; back a little convex; lateral line curved and parallel to the back; vent in the middle of the body.

\*\* Section. *Pectoral fins attached or placed on a fleshy process or elongation.*

**KOELREUTERI.** Ventral fins divided; first dorsal fin with eleven rays. Pallas.

Length about nine inches, the body soft, fat, and whitish-grey; head long, thick, and convex in front; eyes on the top of the head; lips doubled and fleshy; teeth unequal, conic, the anterior ones larger, and one larger on each side above; aperture of the gills lunated; lateral line impressed; vent about the middle of the body with a peduncle behind; fins soft; the first on the back large and brown, with a black terminal band, the rays spinous; the second narrower, yellowish, with a longitudinal deep brown band, and branched rays; pectoral fan-shaped or oval, and placed on a broad pedicle; tail oval and lanceolate, with ramose rays.

#### Genus *Gobiomoroides*.

Head small, with the eyes approximated; gill-covers closed nearly throughout their contour; dorsal fin one.

**PISONIS.** Ventral fins divided; lower jaw longer. Gmel. *Amore pisonum*, Pifo.

A small species found in South America. The head is depressed and covered with scales in size equal to those on the back; the mouth furnished with several rows of teeth; and the tail rounded.

**GOBIUS *Asper***, a name given by Gesner and others to a species of perch called by many *asper pisciculus*, a name confounding it with many other different fishes, and by Linnæus *perca asper*. It is distinguished among the perch tribe by Artedi under the name of the perch with eight or nine black lines on each side. See PERCA.

**GOBIUS *Fluviatilis***, or *Gudgeon*. See CYPRINUS *Gobio*.

**GOBIUS *Marinus***, or *Goget*. See GOBIUS *Niger*.

**GOBLET**, or **GOBELET**, a kind of drinking cup, or bowl; ordinarily of a round figure, and without either foot or handle.

The word is French, *goblet*; which Salmasius, and others, derive from the barbarous Latin *cupa*. Budæus deduces it from the Greek *κοπελλος*, *a sort of cup*.

**GOBLETs**, made of the wood tamarisk, are ranked among medicinal drugs; because the liquors infused a while therein, are supposed to acquire a quality which renders them good in diseases of the spleen.

**GOBONE'**, or **GOROXY**, in *Heraldry*, the same as *conspoon*.

**GOBYGANGE**, in *Geography*, a town of Bengal; eight miles S. E. of Goragot.

**GOCEY**, a town of Hindoostan, in Allahabad; 30 miles N. of Gazypour.

**GOCH**, a town of France, in the department of the Roer, and chief place of a canton, in the district of Cleves, situated on the Niers, surrounded with walls in 1291, and containing three churches; six miles S. of Cleves. The place contains 2412, and the canton 12,728 inhabitants, in 19 communes.

**GOCHLENIUS**, **RONOLPHUS**, in *Biography*, a physician, was born at Wittenberg in 1572. His father was professor of logic at Marburg, where the subject of this article studied medicine, and obtained the degree of doctor in May, 1601; and was himself elected professor of philosophy in 1608, and also professor of mathematics in 1612. He died on the 2d of March 1621, at the age of 49. Although his life was not long, by extreme industry he had written a considerable number of treatises, in which he evinced much of the spirit of Paracelsus, of whom he was a zealous follower. It is unnecessary to enumerate the long list of titles to his works, which relate to philosophy, magnetism,



netism, astrology, chiromancy, &c. as well as to medicine. Eloy.

**GOCIANO**, in *Geography*, a town of the island of Sardinia; 30 miles E. of Algeri.

**GOCKEL**, or **GOKELIUS**, CHRISTIAN LOUIS, in *Biography*, of Gotha in Thuringia, was born on the 31st of December, 1662. In 1685, he was appointed physician to the city of Herspruck, where he acquired great reputation by his practice, and obtained the confidence of several German princes, especially of the duke of Wirtemberg. His publications likewise contributed to extend his fame, consisting of a "Medical Surgery," in German, and of some papers in the Memoirs of the German academy. He died in August 1736, aged 74.

With the preceding physician we must not confound another, called *Everard Gokelius*, who was born at Ulm, in 1636, and practised physic at Giengen in Suabia. Besides some essays in the German language, he published, 1. "Enchiridion Medico-practicum de Peste," 1669.—2. "Consiliorum et Observationum Medicinalium Decades VI." 1682.—3. "Gallicinium Medico-practicum, sive, Consiliorum, Observationum, et Curationum Medicinalium novarum Centuriæ duæ cum dimidia," Ulmæ 1704. Eloy. Dict. Hist.

**GOCULGUR**, in *Geography*, a town of Hindoostan, in the subah of Agra; 16 miles N. W. of Agra.

**GOD**, an immaterial, intelligent, and free being; of perfect goodness, wisdom, and power; who made the universe, and continues to support it, as well as to govern and direct it by his providence.

The Rabbins and Hebraists, particularly St. Jerom, and the interpreters, reckon up ten different names of God in Scripture; which are אֱלֹהִים, *Elohim*, אֱלֹהִי, *Elohi*, or in the singular, אֱלֹהֵי, *Eloah*, אֱלֹהֵי, *Tjebaoth*, אֱלֹהֵי, *Eliou*, אֱלֹהֵי, *Ehjeu*, אֱלֹהֵי, *Adonai*, יְהוָה, *Jah*, אֱלֹהֵי, *Shaddai*, אֱלֹהֵי, *Jehovah*: but it is wrong to divide אֱלֹהֵי, from אֱלֹהֵי; they should be but one name אֱלֹהֵי, *Elohefjebaoth*, i. e. *God of hosts*. Of these names there are three which express the essence of God, and are proper names; viz. אֱלֹהֵי, *Ehjeu*, יְהוָה, *Jah*, and אֱלֹהֵי, *Jehovah*: the others are only names of attributes. St. Jerom gives a particular explanation of these ten names, in his epistle to Marcella; and Buxtorf the younger has an express dissertation on the same, "Dissertatio de Nominibus Dei." The Jesuit Souciet has three several discourses on the three names, *Eh*, *Shaddai*, and *Jehovah*, printed at Paris, 1715. The Hebrews call the name of God אֱלֹהֵי, *Eloah*; and the Greeks, after this example, Θεός, *Theos*; as consisting of four letters, which it is observed to do in most languages: thus, in the Hebrew God is called אֱלֹהֵי, *Jehovah*; in the Greek, Θεός; in Latin, *Deus*; in Spanish, *Dios*; in Italian, *Idio*; in French, *Dieu*; in the ancient Gaulish, *Dies*; in ancient German, *Diet*; in the Slavonic, *Buch*; in Arabic, *Alla*; in the Polish, *Bung*; in the Pannonian, *Iflu*; in the Egyptian, *Tenu*; in the Persian, *Sire*; in the language of the Magi, *Osi*. But a distinction ought here to be made between the name God, and the name of God; it being the latter, not the former, that in the Hebrew consists of four letters. The name or word God, in the Hebrew, is אֱלֹהֵי, *Eloah*, which consists but of three letters; or in the plural, אֱלֹהִים, *Elohim*, which consists of five. The name of God is אֱלֹהֵי, *Jehovah*; which is the true אֱלֹהֵי, *Theos*, or the name of four letters among the Hebrews and Greeks. But it is not this name that answers to the Greek Θεός, Latin *Deus*, English *God*, &c. In reality, none of these languages have any proper name of God, as אֱלֹהֵי, *Jehovah*, is in the Hebrew.

M. Hallenberg, a Swedish writer, in a work published at Stockholm in 1795, and entitled "Dissertatio historica et philologica de origine nominis Dei Gud," &c. suggests that the names given by different nations to the deity might denote unity; as the word *God* itself, by which in all the Teutonic dialects the Supreme Being is denominated.

Philologists have hitherto considered the word *God* as being of the same signification with *Good*; and this is not denied by M. Hallenberg. But he thinks, that both words, originally denoted unity; and that the root is אֱלֹהֵי, *achad*, unus; whence the Syr. *Chad* and *Gada*; the Arab. *Ahd* and *Gald*; the Persic *choda* and *chuda*; the Greek αχας, and γαδ; the Teutonic *Gud*; the German *Gott*; and our Saxon *God*. The other names of God, this author thinks, are referable to a singular origin.

By his immateriality, intelligence, and freedom, God is distinguished from fate, nature, destiny, necessity, chance, anima mundi, and from all the other sensitive beings, acknowledged by the Stoics, Pantheists, Spinofists, and other sorts of atheists.

The knowledge of God, his nature, attributes, word and works, with the relations between him and his creatures, makes the subject of the extensive science called *theology*. In scripture God is defined by, "I am that I am; Alpha and Omega; the Beginning and End of all things."

Among philosophers, he is defined a being of infinite perfection; or in whom there is no defect of any thing which we conceive may raise, improve, or exalt his nature.

Among men, he is chiefly considered as the first cause, the first being, who has existed from the beginning, has created the world, or who subsists necessarily, or of himself.

Sir Isaac Newton chooses to consider and define God, not as is usually done, from his perfections, his nature, existence, or the like; but from his dominion. "The word God, according to him, is a relative term, and has a regard to servants; it is true, it denotes a being eternal, infinite, and absolutely perfect; but a being however eternal, infinite, and absolutely perfect, without dominion, would not be God.

"The word God," the same author observes, "frequently signifies *Lord*; but every lord is not God: it is the dominion of a spiritual being or lord, that constitutes God; true dominion, true God; supreme, the supreme; signed, the false god.

"From such true dominion it follows, that the true God is living, intelligent, and powerful; and from his other perfections, that he is supreme, or supremely perfect; he is eternal, and infinite; omnipotent, and omniscient; that is, he endures from eternity to eternity, and is present from infinity to infinity.

"He governs all things that exist, and knows all things that are to be known: he is not eternity, or infinity, but eternal and infinite: he is not duration or space, but he endures, and is present: he endures always, and is present every where; and by existing always, and every where, he constitutes the very thing, duration and space, eternity and infinity.

"Since every particle of space is always, and every indivisible moment of duration every where, the Creator and Lord of all things can never be *namquam*, or *ququam*.

"He is omnipresent, not only virtually, but also substantially: for power without substance cannot subsist. All things are contained, and move, in him; but without any mutual passion: he suffers nothing from the motions of be-

dies; nor do they undergo any resistance from his omnipresence.

“ It is confessed, that God exists necessarily; and by the same necessity he exists always, and every where. Hence, also, he must be perfectly similar; all eye, all ear, all brain, all arm, all the power of perceiving, understanding, and acting; but after a manner not at all corporeal, after a manner not like that of men, after a manner wholly to us unknown.

“ He is destitute of all body, and all bodily shape; and therefore cannot be seen, heard, or touched; nor ought to be worshipped under the representation of any thing corporeal.

“ We have ideas of the attributes of God, but do not know the substance even of any thing; we see only the figures and colours of bodies, hear only sounds, touch only the outward surfaces, smell only odours, and taste tastes; and do not, cannot, by any sense, or any reflex act, know their inward substances; and much less can we have any notion of the substance of God.

“ We know him by his properties and attributes; by the most wise and excellent structure of things, and by final causes; but we adore and worship him only on account of his dominion: for God, setting aside dominion, providence, and final causes, is nothing else but fate and nature.” Newt. Philos. Nat. Princip. Math. in calce.

An ingenious divine has wrought these thoughts of that admirable philosopher into form, and ripened them into a more express system, in a discourse on this subject. Maxwell's Disc. concerning God.

We shall here subjoin a compendious abstract of the principal arguments that have been alleged in proof of the existence of God. The admirable metaphysician and divine, Dr. Clarke, has demonstrated this truth, with that clearness and force of reasoning, for which he is so eminently distinguished, by a series of propositions, mutually connected and dependent, and forming a complete and unanswerable argument in proof both of the being and attributes of the Deity. 1. Something has existed from all eternity; for, since something now is, something always was; otherwise the things that now are must have been produced out of nothing, absolutely and without cause; which is plain contradiction in terms. 2. There has existed from eternity some one unchangeable and independent being; or else, there has been an infinite succession of changeable and dependent beings produced one from another in an endless progression, without any original cause at all. From without, this series of beings can have no cause of its existence, because it includes all things that are or ever were in the universe: nor is any one being in this infinite succession self-existent or necessary, and therefore it can have no reason of its existence within itself; and it was equally possible, that from eternity, there should never have existed any thing at all, as that a succession of such beings should have existed from eternity. Consequently, their existence is determined by nothing; neither by any necessity of their own nature, because none of them are self-existent; nor by any other being, because no other is supposed to exist. 3. That unchangeable and independent being, which has existed from eternity, without any external cause of its existence, must be self-existent, *i. e.* it must exist by an absolute necessity originally in the nature of the thing itself, and antecedent in the natural order of our ideas to our supposition of its being. For whatever exists must either have come into being out of nothing without cause; or it must have been produced by some external cause; or it must be self-existent: but the two former suppositions are contrary

to the two first propositions. From this last proposition it follows, that the only true idea of a self-existent, or necessarily existing being, is the idea of a being, the supposition of whose non-existence is an express contradiction; and this idea is that of a most simple being, absolutely eternal and infinite, original and independent. It follows also, that nothing is so certain as the existence of a supreme independent cause; and likewise that the material world cannot possibly be the first and original being, uncreated, independent, and of itself eternal; because it does not exist by an absolute necessity in its own nature, so as that it must be an express contradiction to suppose it not to exist. With respect both to its form and matter, the material world may be conceived not to be, or to be in any respect different from what it is, without a contradiction. 4 and 5. The substance or essence of the self-existent being is absolutely incomprehensible by us; nevertheless, many of the essential attributes of his nature are strictly demonstrable, as well as his existence. The self-existent being, having no cause of its existence but the absolute necessity of its own nature, must of necessity have existed from everlasting, without beginning; and must of necessity exist to everlasting, without end. 6. The self-existent being must of necessity be infinite and omnipresent. Such a being must be every where, as well as always, unalterably the same. It follows from hence, that the self-existent being must be a most simple, unchangeable, incorruptible being; without parts, figure, motion, divisibility, and other properties of matter, which are utterly inconsistent with complete infinity. 7. The self-existent being, must of necessity be but one; because in absolute necessity there can be no difference or diversity of existence; and, therefore, it is absolutely impossible, that there should be two independent self-existent principles, such *e. g.* as God and matter. 8. The self-existent and original cause of all things must be an intelligent being. This proposition cannot be demonstrated strictly and properly *à priori*; but a *posteriori*, the world affords undeniable arguments to prove that all things are the effects of an intelligent and knowing cause. The cause must be always more excellent than the effect; and, therefore, from the various kinds of powers and degrees of excellence and perfection, which visible objects possess; from the intelligence of created beings, which is a real distinct quality or perfection, and not a mere effect or composition of unintelligent figure and motion; from the variety, order, beauty, wonderful contrivance, and fitness of all things to their proper and respective ends; and from the original of motion, the self-existent creating being is demonstrated to be intelligent. 9. The self-existent and original cause of all things is not a necessary agent, but a being endued with liberty and choice. Liberty is a necessary consequent of intelligence: without liberty, no being can be said to be an agent, or cause of any thing; since to act necessarily is really and properly not to act at all, but to be acted upon. Besides, if the supreme cause be not endued with liberty, it will follow, that nothing which is not could possibly have been; that nothing which is could possibly not have been; and that no mode or circumstance of the existence of any thing could possibly have been in any respect otherwise than it now actually is. Farther, if there be any final cause in the universe, the supreme cause is a free agent; and on the contrary supposition, it is impossible that any effect should be finite; and in every effect, there must have been a progression of causes *in infinitum*, without any original cause at all. 10. The self-existent being, the supreme cause of all things, must of necessity have infinite power; since all things were made by him, and are entirely dependent upon him; and all the powers of all things are derived from him, and perfectly sub-

ject to him; nothing can resist the execution of his will. 11. The supreme cause and author of all things must of necessity be infinitely wise. This follows from the proposition already established; and the proof *a posteriori*, of the infinite wisdom of God, from the consideration of the exquisite perfection and consummate excellency of his works, is no less strong and undeniable. 12. The supreme cause and author of all things must of necessity be a being of infinite goodness, justice, and truth, and all other moral perfection; such as become the supreme governor and judge of the world. The will of a being, infinitely knowing and wise, independent and all-powerful, can never be influenced by any wrong affection, and can never be misled or opposed from without; and, therefore, he must do always what he knows fittest to be done; that is, he must act always according to the strictest rules of infinite goodness, justice, and truth, and all other moral perfections, and more particularly, being infinitely and necessarily happy and all-sufficient, he must be unalterably disposed to do and to communicate good or happiness. See Clarke's Demonstration of the Being and Attributes of God, passim.

To this more abrupt argument *a priori*, for the existence of God, we may add another, more generally obvious, and carrying irresistible conviction, which is deduced from the frame of the universe, and from the traces of evident contrivance and fitness of things for one another that occur through all the parts of it. These conspire to prove, that the material world, which in its nature is originated and dependent, could not have been the effect of chance or necessity, but of intelligence and design. The beautiful, harmonious, and beneficial arrangement of the various bodies that compose the material system; their mutual dependence and subserviency; the regularity of their motions, and the aptitude of these motions for producing the most beneficial effects; and many other phenomena resulting from their relation, magnitude, situation, and use, afford unquestionable evidences of the creating power and wise disposal of an intelligent and almighty agent. The power of gravity, by which the celestial bodies persevere in their revolutions, deserves our particular consideration. This power penetrates to the centres of the sun and planets, without any diminution of its virtue, and is extended to immense distances, regularly decreasing, and producing the most sensible and important effects. Its action is proportional to the quantity of solid matter in bodies, and not to their surfaces, as is usual in mechanical causes; and, therefore, seems to surpass mere mechanism. But however various the phenomena that depend on this power, and may be explained by it, no mechanical principles can account for its effects; much less could it have produced, at the beginning, the regular situation of the orbs, and the present disposition of things. Gravity could not have determined the planets to move from west to east in orbits nearly circular, almost in the same plane; nor could this power have projected the comets with all the variety of their directions. If we suppose the matter of the system to be accumulated in the centre by its gravity, no mechanical principles, with the assistance of this power, could separate the huge and unwieldy mass into such parts as the sun and planets; and, after carrying them to their different distances, project them in their several directions, preserving still the equality of action and re-action, or the state of the centre of gravity of the system. Such an exquisite structure of things could only arise from the contrivance and powerful influences of an intelligent, free, and most potent agent. The same powers, therefore, which at present govern the material universe and conduct its various

motions, are very different from those which were necessary to have produced it from nothing, or to have disposed it in the admirable form in which it now presents itself.

But we should far exceed the proper limits of this article, if, confining our observation to the earth, our contemplation, we were to enumerate only the principal objects of design and wisdom, as well as goodness, which are discernible in its figure and constituent parts, in its diurnal and annual motion, in the position of its axis with regard to its orbit, in the benefit which it derives from the light and heat of the sun, and the alternate vicissitudes of the seasons; in the atmosphere which surrounds it, and in the different species and varieties of vegetables and animals, with which it is replenished. No one can survey the vegetable productions of the earth, so various, beautiful, and useful; nor the various gradations of animal life, in fact a variety of species, all preserved distinct, and propagated by a settled law, each fitted to its own element, provided with proper food, and with instincts and organs fitted to its rank and situation, and especially with the powers of sensation and self-motion, and all more immediately or remotely subservient to the government and use of man; without admiring the skill and design of the original Formers. But these are more signally manifested in the structure of the human frame, and in the noble powers and capacities of the human mind; more especially in the moral principles and faculties, which are a distinguishing part of our constitution; and lead to the perception and acknowledgment of the existence and government of God. In those instances that have now been recited, and a variety of similar instances suggested by them, or naturally occurring to the notice of the curious and reflecting mind, contrivance is manifest, and immediately, without any nice or subtle reasonings, suggests a contriver. It strikes us like a sensation; and artful reasonings against it may puzzle us, without shaking our belief. No person, for example, that knows the principles of optics, and the structure of the eye, can believe that it was formed without skill in that science; and therefore, Sturmius held that the examination of the eye was a cure for atheism; and another excellent writer, cited below, observes, that if there were no example in the world of contrivance, except that of the eye, it would be alone sufficient to support the conclusion which we draw from it, as to the necessity of an intelligent creator: nor can it be supposed that the ear was formed without the knowledge of sounds; or that the male and female, created and preserved in due proportion, were not formed for each other, and for continuing the species. All our accounts of nature are full of instances of this kind. The admirable and beautiful structure of things for final causes evince the wisdom of the contriver; and the unity of design shews him to be one. The great motions in the system, performed with the same facility as the least, suggest his almighty power, which gave motion to the earth and the celestial bodies, with equal ease as to the minutest particles; the subtilty of the motions and actions in the internal parts of bodies, shews that his influence penetrates the inmost recesses of things, and that he is equally active and present every where. The simplicity of the laws that prevail in the world, the excellent disposition of things, in order to obtain the best ends; and the beauty which adorns the works of nature, far superior to any thing in art, suggest his consummate wisdom. The usefulness of the whole scheme, so well contrived for the intelligent beings who enjoy it, with the internal disposition and moral structure of those beings, shews his unbounded goodness. These are arguments which are sufficiently open to the views and capacities of the unlearned, while it the

same time they acquire new strength and lustre from the discoveries of the learned. The Deity's acting and interposing in the universe shew that he governs it as well as formed it; and the depth of his counsels, even in conducting the material universe, of which a great part surpasses our knowledge, tends to preserve an inward veneration and awe of this great being, and disposes us to receive what may be otherwise revealed to us concerning him. His essence, as well as that of all other substances, is beyond the reach of all our discoveries; but his attributes clearly appear in his admirable works. We know that the highest conceptions we are able to form of them are still beneath his real perfections; but his dominion over us, and our duty towards him, are manifest. See Maclaurin's Account of Sir I. Newton's Phil. Disc. book iv. chap. 9.

Those who wish to see the argument, which has been now sketched out in some of its leading outlines, more fully illustrated and urged, may consult the works of Ray, Nieuwentyt, Baxter in his *Matho*, Derham, De la Pluche in his *Nature displayed*, &c.; and more especially archdeacon Paley in his "*Natural Theology, or Evidences of the Existence and attributes of the Deity, collected from the appearances of Nature.*" This admirable work, if our limits would allow it, would enable us very much to enrich this article. One atheistic way, says this much approved and popular writer, of replying to our observations upon the works of Nature, and to the proofs of a Deity which we think that we perceive in them, is to tell us, that all which we see must necessarily have had some form, and that it might as well be in its present form as any. Let us now apply this answer to the eye.—"Something or other must have occupied that place in the animal's head; must have filled up, we will say, that socket; we will say also, that it must have been of that sort of substance, which we call animal substance, as flesh, bone, membrane, cartilage, &c.; but that it should have been an eye, knowing as we do what an eye comprehends, *viz.* that it should have consisted, first, of a series of transparent lenses, (very different, by the bye, even in their substances from the opaque materials of which the rest of the body is, in general at least, composed; and with which the whole of its surface, this single portion of it excepted, is covered): secondly, of a black cloth or canvas (the only membrane of the body which is black) spread out behind these lenses, so as to receive the image formed by pencils of light transmitted through them; and placed at the precise geometrical distance at which, and at which alone, a distinct image could be formed, namely, at the concurrence of the refracted rays; thirdly, of a large nerve communicating between this membrane and the brain; without which the action of light upon the membrane, however modified by the organ, would be lost to the purposes of sensation. That this fortunate conformation of the parts should have been the lot, not of one individual out of many thousand individuals, like the great prize in a lottery, or like some singularity in nature, but the happy chance of a whole species; nor of one species out of many thousand species, with which we are acquainted; but of by far the greatest number of all that exist, and that under varieties, not casual or capricious, but bearing marks of being suited to their respective exigencies; that all this should have taken place, merely because something must have occupied these points in every animal's forehead; or that, all this should be thought to be accounted for by the short answer, "that whatever was there must have had some form or other," is too absurd to be made more so by any argument."—"Nor does it mend the answer to add, with respect to the singularity of the conformation, that, after the event, it is no longer to be

computed what the chances were against it. This is always to be computed, when the question is, whether an useful or imitative conformation be the produce of chance or not. I desire no greater certainty in reasoning than that by which chance is excluded from the present disposition of the natural world. Universal experience is against it. What does chance ever do for us? In the human body, for instance, chance, *i. e.* the operation of causes without design, may produce a wen, a wart, a mole, a pimple, but never an eye. Among inanimate substances, a clod, a pebble, a liquid drop, might be; but never was a watch, a telescope, or organized body of any kind, answering a valuable purpose by a complicated mechanism, the effect of chance. In no assignable instance hath such a thing existed, without intention, somewhere." Some have said "that the eye, the animal to which it belongs, every other animal, every plant, and every organized body which we see, are only so many out of the possible varieties and combinations of being, which the lapse of infinite ages has brought into existence; and that the present world is the relief of that variety."—But "there is no foundation whatever for this conjecture in any thing which we observe in the works of nature: no such experiments are going on at present! No such energy operates as that which is here supposed, and which should be constantly pushing into existence new varieties of beings; nor are there any appearances to support an opinion that every possible combination of vegetable or animal structure has formerly been tried." Should it be said that the parts of animal bodies "were not intended for the use, but that the use arose out of the parts; this distinction is intelligible."—But "there is little place for it in the works of nature. When roundly and generally affirmed of them, as it has sometimes been, it amounts to such another stretch of assertion, as it would be to say, that all the implements of the cabinet-maker's workshop, as well as his fish-skin, were substances accidentally configurated, which he had picked up and converted to his use; that his adzes, saws, planes, and gimlets, were not made, as we suppose, to hew, cut, smooth, shape-out, or bore wood with; but, that these things being made, no matter with what design, or whether with any, the cabinet-maker perceived that they were applicable to his purpose, and turned them to account." If this kind of solution "be applied to those parts of animals, the action of which does not depend upon the will of the animal, it is fraught with still more evident absurdity. Is it possible to believe that the eye was formed without any regard to vision, that it was the animal itself which found out, that though formed with no such intention, it would serve to see with; and that the use of the eye, as an organ of sight, resulted from this discovery, and the animal's application of it? The same question may be asked of the ear: the same of all the senses," none of which depend upon the election of the animal; nor consequently upon his sagacity or experience. "Others have chosen to refer every thing to a *principle of order* in nature. A principle of order is the word; but what is meant by a principle of order, as different from an intelligent creator, has not been explained either by definition or example; and without such explanation, it should seem to be a mere substitution of words for reasons, names for causes."—"Was a watch ever produced by a principle of order; and why might not a watch be so produced as well as an eye?"—"The confidence," continues the author now cited, "which we place in our observations upon the works of nature, in the marks which we discover of contrivance, choice, and design, and in our reasoning upon the proofs afforded us, ought not to be shaken, as it is sometimes attempted to be done, by bringing forward to our view our own ignorance, or rather the general imperfection of

our knowledge of nature."—"True fortitude of understanding consists in not suffering what we know to be disturbed by what we do not know. If we perceive an useful end, and means adapted to that end, we perceive enough for our conclusion. If these things be clear, no matter what is obscure. The argument is finished."—"Our ignorance of many points need not suspend our assurance of a few."—"Contrivance," says our author, "if established, appears to me to prove every thing which we wish to prove. Amongst other things, it proves the *personality* of the Deity, as distinguished from what is sometimes called nature, sometimes called a principle: which terms, in the mouths of those who use them philosophically, seem to be intended, to admit and express an efficacy, but to exclude and deny a personal agent. Now that which can contrive, which can design, must be a person. These capacities constitute personality, for they imply consciousness and thought. They require that which can perceive an end or purpose; as well as the power of providing means, and of directing them to their end. They require a centre, in which perfections unite, and from which volitions flow; which is mind. The acts of a mind prove the existence of a mind; and that, whatever it be, in which a mind resides, is a person,—"Whenever we see marks of contrivance, we are led for its cause to an *intelligent* author. And this transition of the understanding is founded upon uniform experience."—"There may be many second causes, and many causes of second causes, one behind another, between what we observe of nature and the Deity; but there must be intelligence somewhere; there must be more in nature than what we see; and amongst the things unseen, there must be an intelligent designing author;"—"after all the struggles of a reluctant philosophy, the necessary resort is to a deity. The marks of *design* are too strong to be got over. Design must have had a designer. The designer must have been a person. That person is God." But we must content ourselves with earnestly recommending the works from which these detached extracts are made, to the perusal of our readers; for we cannot do justice to the author's admirable reasoning.

Another argument to prove the existence of God, as the creator and governor of the universe, may be deduced from the universal consent of mankind, and the uniform tradition of this belief through every nation and every age; it is impossible to conceive, that a fallacy so perpetual and universal, should be imposed on the united reason of mankind. No credible and satisfactory account can be given of this universal consent, without ascribing it to the original constitution of the human mind, in consequence of which it cannot fail to discern the existence of a deity, and to the undeniable traces of his being, which his works afford. Fear, state-policy, and the prejudices of education, to which the concurrence of mankind in this principle has been sometimes resolved, are founded on this universal principle, suppose its being and influence, and are actuated by it. It is much more reasonable to imagine, that the belief of a God was antecedent to their operation, than that it should have been produced by them; and that it was dictated by reason and conscience, independent of the passions and policy of men. The uniform and universal tradition of this belief, and of the creation of the world by the divine power, affords concurring evidence both of the principle and of the fact.

The existence of God is also farther evinced by those arguments which have been usually alleged to prove, that the world had a beginning, and, therefore, that it must have been created by the energy of divine power. In proof of this, the history of Moses, considered merely as the most

ancient historian, deserves particular regard. His testimony is confirmed by the most ancient writers among the heathens, both poets and historians. It may be also fairly alleged, that we have no history or tradition more ancient than that which agrees with the received opinion of the world's beginning, and of the manner in which it was produced; and that the most ancient histories were written long after that time. And this consideration is urged by Lucretius, the famous Epicurean, as a strong presumption that the world had a beginning.

"———Si nulla fuit genitalis origo  
Terrarum et cœli, semperque æterna fuere;  
Cur supra bellum Thebanum, et funera Trojæ,  
Non alias alii quoque res cecinerit poetæ?"

Besides, the origin and progress of learning, and the most useful arts, confirm the notion of the world's beginning, and of the common era of its creation; to which also may be added, that the world itself, being material and corruptible, must have had a beginning; and many phenomena occur to the observation of the astronomer and natural historian, which furnish a strong presumption that it could have had no long duration, and that it gradually tends to dissolution. From all these considerations we may infer the existence, attributes, and providence of God. If we admit miracles, as facts authenticated by credible history, these, considered as deviations from the established course of nature, afford independent evidence of the being of God. See MIRACLES.

God is also used in speaking of the false deities of the heathens, many of which were only creatures to which divine honours and worship were superstitiously paid.

The Greeks and Latins, it is observable, did not mean, by the name God, an all-perfect being, whereof eternity, infinity, omnipresence, &c. were essential attributes: with them, the word only implied an excellent and superior nature; and, accordingly, they give the appellation gods to all beings of a rank, or class, higher and more perfect than that of men; and especially to those who were inferior agents in the divine administration, all subject to the one supreme.

Thus men themselves, according to their system, might become gods, after death; inasmuch as their souls might attain to a degree of excellence superior to what they were capable of in life.

The first divines, father Bossuet observes, were the poets: the two functions, though now separated, were originally combined; or, rather, were one and the same thing. Now the great variety of attributes in God, that is, the number of relations, capacities, and circumstances, wherein they had occasion to consider him, put these poets, &c. under a necessity of making a partition, and of separating the divine attributes into several persons: because the weakness of the human mind could not conceive so much power and action in the simplicity of one single divine nature. Thus the omnipotence of God came to be represented under the person and appellation of Jupiter; the wisdom of God under that of Minerva; the justice of God under that of Juno.

The first idols, or false gods, that are said to have been adored, were the stars, sun, moon, &c. on account of the light, heat, and other benefits which we derive from them. (See IDOLATRY.) Afterwards the earth came to be deified, for furnishing fruits necessary for the subsistence of men and animals; then fire and water became objects of divine worship, for their usefulness to human life. In process of time, and by degrees, gods became multiplied to infinity; and there was scarce any thing but the weakness, or caprice of

some devotee or other, elevated into the rank of deity; things useless, or even destructive not excepted.

The principal of the ancient gods, whom the Romans called *dii majorum gentium*, and which Cicero calls *caelestia gods*, Varro *select gods*, Ovid *nobiles deos*, others *consentes deos*, were Jupiter, Juno, Vesta, Minerva, Ceres, Diana, Venus, Mars, Mercury, Neptune, Vulcan, and Apollo. Jupiter is considered as the god of heaven; Neptune as god of the sea; Mars as the god of war; Apollo of eloquence, poetry, and physic; Mercury of thieves, Bacchus of wine, Cupid of love, &c.

A second sort of gods, called *semi-gods, semi-dii, dii minorum gentium, indigetes*, or gods adopted, were men canonized and deified. As the greater gods had possession of heaven by their own right; these secondary deities had it by right and donation; being translated into heaven because they had lived as gods upon earth.

The heathen gods may be all reduced to the following classes:

1. Created spirits, angels, or demons: whence good and evil gods; Genii, Lares, Lemures, Typhones, guardian gods, infernal gods, &c.

2. Heavenly bodies; as the sun, moon, and other planets: also the fixed stars, constellations, &c.

3. Elements; as air, earth, ocean, Ops, Vesta; the rivers, fountains, &c.

4. Meteors. Thus the Persians adored the wind: thunder and lightning were honoured under the name of Geryon; and several nations of India and America have made themselves gods of the same. Callor, Pollux, Helena, and Iris, have also been preferred from meteors to be gods; and the like has been practised in regard to comets: witness that which appeared at the murder of Cæsar. Soerates deified the clouds, if we may give credit to Aristophanes; and the primitive Christians, Tertullian assures us, were reproached with the same thing.

5. They erected minerals, or fossils, into deities. Such was the Bætylus; the Finlanders adored stones; the Scythians iron; and many nations silver and gold.

6. Plants have been made gods. Thus leeks and onions were deities in Egypt; the Selavi, Lithuanians, Celts, Vandals, and Peruvians, adored trees and forests; the ancient Gauls, Britons, and Druids, paid a particular devotion to the oak; and it was no other than wheat, corn, feed, &c. that the ancients adored under the names of Ceres and Proserpina.

7. They took themselves gods from among the waters. The Syrians and Egyptians adored fishes; and the Tritons, Nereids, Syrens, &c. what were they but fishes? Several nations have adored serpents; particularly the Egyptians, Prussians, Lithuanians, Samogitians, &c.

8. Insects, as flies and ants, had their priests and votaries: these among the Thebans, and those in Acarnania, where bullocks were offered to them.

9. Among birds, the stork, raven, the sparrowhawk, ibis, eagle, griffon, and lapwing, have had divine honours; the last in Mexico, the rest in Egypt, and at Thebes.

10. Four-footed beasts have had their altars; as the bull, dog, cat, wolf, baboon, lion, and crocodile, in Egypt, and elsewhere; the hog in the island of Crete: rats and mice in the Troas, and at Tenedos; weasels at Thebes, and the porcupine throughout all Zoroaster's school.

11. Nothing was more common than to place men among the number of deities; and from Belus or Baal, to the Roman emperors before Constantine, the instances of this kind are innumerable; frequently they did not wait so long as their deaths for the apotheosis. Nebuchadnezzar procured his statue

to be worshipped while living; and Virgil shews that Augustus had altars and sacrifices offered to him, Eclog. i 6, 7. As we learn, from other hands, that he had priests called *Augustales*; and temples at Lyons, Narbona, and several other places; and he must be allowed the first of the Romans, in whose behalf idolatry was carried to such a pitch. The Ethiopians deemed all their kings gods: the Velleda of the Germans; the Janus of the Hungarians; and the Thaut, Woden, and Asa, of the northern nations, were, indisputably, men.

12. Not men only, but every thing that relates to man, has also been deified: as labour, rest, sleep, youth, age, death, virtues, vices, occasion, time, place, numbers, among the Pythagoreans; the generative power, under the name of Priapus. Infancy, alone, had a cloud of deities; as Vagettanus, Levana, Rumina, Edufa, Potina, Cuba, Cumina, Carna, Osiilago, Statulinus, Fabulinus, &c.

They also adored the gods health, fever, fear, love, pain, indignation, shame, impudence, opinion, renown, prudence, science, art, fidelity, felicity, calumny, liberty, money, war, peace, victory, triumph, &c.

Lastly, nature, the universe, or  $\tau\omicron\ \pi\alpha\iota$ , was reputed a great god.

Hesiod has a poem under the title of  $\Theta\epsilon\gamma\gamma\eta\sigma\iota\varsigma$ , i. e. the generation of the gods; wherein he explains their genealogy and descent; sets forth who was the first, and principal; who next descended from him, and what issue each had: the whole making a sort of system of heathen theology.

Beside this popular theology, each philosopher had his system: as may be seen from the Timæus of Plato, and Cicero De Natura Deorum.

Justin Martyr, Tertullian in his Apologetics, and in his book Contra Gentes; Arnobius, Minutius Felix, Lactantius, Eusebius, Præpar. & Demonst. Evangel. St. Augustine De Civit. Dei, and Theodoret Advers. Gentes, shew the vanity of the heathen gods.

It is very difficult to discover the real sentiments of the heathens with respect to their gods: they are exceedingly intricate and confused, and even frequently contradictory. They admitted so many superior and inferior gods, who shared the empire, that all was full of gods. Varro reckons up no less than 30,000 adored within a small extent of ground, and yet their number was every day growing. The way to heaven was so easy for the great men of those days, that Juvenal brings in Atlas complaining he was ready to sink under the load of such a number of new gods as were daily placed in the heavens: yet father Mourguies seems to have proved that all the philosophers of antiquity have acknowledged that there was but one God. Plan. Theol. des Sect. Scavans. de la Greece.

GOD, *Ab of.* See DISABILITY.

GOD, *Peace of.* See PEACE.

GOD, *Son of.* See SON.

GOD, *Truce of.* See TRUCE.

GOD, *Worship of.* See WORSHIP.

GODAGARÿ, in *Geography*, a town of Bengal; 18 miles N. of Moorshedabad.

GODALMING, a market town and parish in the county of Surry, England, contains 474 houses and 3405 inhabitants. The town is built in a valley, on the banks of the river Wey, which is divided into several small streams here. The chief of these is navigable to Weybridge, where it unites its waters with the Thames. In the vicinity of the town are some corn-mills, and paper-mills. Here are several manufactories for weaving stockings, patent fleecy hosiery, and coarse woollen cloths; wool-combing and spinning of worsted also constitute part of the trade of the place. The parish



parish of Godalming is divided into nine tythings, and the whole is governed by a warden, eight assistants, and a bailiff. The church is distinguished by its handsome spire. In the town are a quakers' meeting-house, two chapels for dissenters, a charity school, and in the immediate vicinity is an hospital for the accommodation of ten poor men. A singular imposition on public credulity and curiosity was practised in this town about the year 1726. A female, named Mary Tofts, circulated a report that she was pregnant with rabbits, and also excited a very general belief that she had actually been delivered of some of these animals. The imposition, like that of "the Cock-lane ghost," was supported with so much cunning and address, that many persons, among whom were some of the faculty, were deceived, and, for some time, credited the tale. Godalming has a weekly market on Saturday, and two annual fairs. Manning's *History and Antiquities of Surrey*, folio.

**GODAMA, GODEMA, Gaudma, Gotma, or Goutom**, in *Indian Mythology*, different names applied in various parts of India, and particularly in the Burman empire, to their deity Budha, or Buddha. (See **BOODH**.) Godama or Kodama is the most common appellation among his worshippers in India beyond the Ganges; it seems also to be common among the Hindoos, who, according to the idiom of the Sanscrit, write it Gotamas. This name, as some say, literally signifies cow-herd, but metaphorically king; and, according to others, the meaning of Godama is evidently wife, or a sage. Many other appellations are given to this deity derived from the postures in which his various images represent him. Godama was probably an Indian prince, deified by superstition; and in an ancient treatise, giving an account of the religion of Godama, entitled "Zarado," Godama is said to have attained divinity at the age of 35 years, to have preached his law for 45 years, and to have brought salvation to all living beings. Dr. Buchanan, who cites this treatise (*As. Res.* vol. vi.) places the death of Godama 546 years B. C. The doctrine and laws, said in this treatise to be delivered by Godama, consist chiefly in observing the five commandments, and in abstaining from the ten sins. The five commandments are as follow: 1. From the meanest insect up to man, thou shalt kill no animal whatever. 2. Thou shalt not steal. 3. Thou shalt not violate the wife or concubine of another. 4. Thou shalt tell nothing false. 5. Thou shalt drink neither wine, nor any thing that will intoxicate; thou shalt not eat opium, or any other inebriating drug. The person who keeps these five commandments shall attain high rank, and shall not be liable to poverty, nor to other misfortunes and calamities. The ten sins are the killing of animals— theft—adultery—falsehood—discord—harsh and indignant language—idle and superfluous talk—the coveting of your neighbour's goods—envy, and the desire of your neighbour's death, or misfortune—and the following of the doctrine of false gods. Every one who abstains from these sins, will successively increase in virtue through all his successive transmigrations, till at length he will become worthy of beholding a God, and of hearing his great voice; and he will be exempted from the four human miseries, *viz.* weight, old age, disease, and death. The good works required are giving alms, and thoughtfully pronouncing three words. Whoever dies without the abstinence and good works here prescribed, will certainly pass into one of the infernal states, and be doomed to certain transmigrations. The priests of Godama are called Rahans in the Burma language, and they have also bestowed upon them the title of Somona or Samana, which is likewise applied to the images of the divinity when he is represented,

as he commonly is, in the priestly habit. (See **RAHANS**.) Godama commanded his images and relics to be worshipped. The largest and most celebrated temples are generally in the form of a pyramid; and contain some of these relics, such as a tooth, a bone, a hair, or a garment. To these temples the prayers of the devout are addressed, and their offerings presented. The images of the god are of very various materials; clay, copper, silver, and alabaster. Many of them are richly gilt, and adorned with paintings of flowers; they are of different sizes, some being not above six inches high, and others of a colossal stature. Other objects of great veneration among the worshippers of Godama are stones of large dimensions, carved with various hieroglyphics, and said to represent, or to be the impressions of his feet. The principal disciples of Godama are by his followers considered as saints; and many images of these, in a priestly habit, accompany that of their master. Every true worshipper of Godama prays before he goes to sleep, and before he rises in the morning, which is generally at the dawn of day.

Besides their private devotions, which are numerous and regularly performed, it is customary to make offerings at the temple; the seasons for which are those of the four phases of the moon, especially the full and change, which may be considered as the Burma sabbaths. Friday is with them reckoned an unfortunate day, and therefore on this day they undertake no business; but they keep holy no particular day of the week. The sect of Godama esteem the opinion of a divine being, who created the universe, to be highly impious; and accordingly the followers of Godama are, strictly speaking, atheists, as they suppose every thing to arise from fate; and their gods are merely men, who by their virtue acquire supreme happiness, and by their wisdom become entitled to impose a law on all living beings. See **BIRMAN Empire**, and **BOODH**.

**GODANA**, in *Geography*, a town of Persia, in the province of Irak; 105 miles E. of Ispahan.

**GODAVERY**, or **GONGA GONOWRY**, a river of Hindoostan, sometimes called the *Gang* in Perisita's History, was, till very lately, considered as the same with the Cattaek river, or Mahanaddy; but it is now ascertained to be a different river, which has its source about 70 miles N.E. of Bombay; on the western Gauts, more properly called the Sukkien mountains; and, in the upper part of its course, at least, is esteemed a sacred river by the Hindoos; that is, ablutions performed in its stream have a religious efficacy superior to those performed in ordinary streams. The Godavery, after traversing the Dowatabad soubah, and the country of Tellingana, from west to east, turns to the south-east; and receiving the Bain Gonga, about 90 miles above the sea, besides many smaller rivers, separates into two principal channels at Rajamundry; and thence subdividing again, they form altogether several tide harbours, for vessels of moderate burden. Ingeram, Coringa, Yanam, Bandarmalanka, and Narfapour, are among the places situated at the mouth of this river; which appears to be the most considerable one between the Ganges and cape Comorin. Extensive forests of teak-trees border on its banks, within the mountains, and supply ship-timber for the use of the ports above-mentioned. The Killnah and Godavery rivers, however remote at their fountains, approach within 80 miles of each other in the lower parts of their course; and form an extensive tract of country, composed of rich vegetable mould, such as is usually found at the mouths of large rivers. See **DILVA**.

**GOD-BOTE**, in our *Antient Roman Customs*, an ecclesiastical or church fine, for crimes and offences committed

against God. These, according to Blackstone, are *apostacy* and *heresy*: which see.

GODDARD, JONATHAN, in *Biography*, an eminent physician and chemist, was born at Greenwich in the year 1617. After studying for four years at Oxford, he set out on his travels, and on his return he settled in practice in London, having taken his degree at Cambridge. He was elected a fellow of the College of Physicians in 1646, and in 1647 was appointed lecturer on anatomy. In conjunction with some friends, he formed a society for experimental inquiry, which met at his lodgings in Wood-street, and in promoting the objects of which he was extremely assiduous. Having gained considerable reputation, and having, with the rest of his party, sided with parliament, he was appointed by Cromwell chief physician to the army, and in this capacity accompanied the usurper to Ireland in 1649, to Scotland in the following year, and thence returned with his master, who, after the battle of Worcester, rode into London in triumph, September 12th, 1651. He obtained many favours from Cromwell, who first made him warden of Merton college, Oxford, afterwards sole representative of that university in the Short Parliament in 1653; and in the same year one of the council of state. These favours were sufficient to procure for him the displeasure of Charles II.; and, being driven from Oxford, he removed to Gresham college, where he had been chosen professor of physic in November 1655. Here he continued to frequent those meetings, which gave birth to the Royal Society, and was nominated one of the first council of that institution in the charter. Dr. Goddard was a conscientious and able practitioner. Partly from the love of experimental chemistry, principally from a distrust in the knowledge of apothecaries, he prepared his own medicines, and recommended the practice to be adopted by physicians in general. Finding numerous obstacles, however, in his way, he published "A Discourse, setting forth the unhappy condition of the practice of physic in London," 1669. But this was of no avail. He died on the 24th of March, 1674, being seized with an apoplectic fit in Cheap-side, when returning from one of the philosophic meetings. Two papers of his were published in the Philosophical Transactions, N 137, 138; and many others in Birch's History of the Royal Society.

GODDESS, DEA, *Dea*, a heathen deity, to whom they attributed the female sex.

The ancients had almost as many goddesses as gods. Such were Juno, the goddess of air; Diana, the goddess of woods and chastity; Proserpina, the goddess of hell; Venus, of beauty; Thetis, of the sea: such also were Victory, Fortune, &c.

Nay they were not contented to make women gods, and admit both sexes into the roll; but they had also hermaphrodite gods. Thus Minerva, according to several of the learned, was both man and woman, and worshipped both under the appellation of Lunus and Luna. Mithras, the Persian deity, was both god and goddess, and the sexes of Venus and Vulcan are very dubious: whence, in the invocations of those deities, they used this formula; "Be thou god or goddess;" as we learn from A. Gellius. It was a privilege peculiar to goddesses, that they might be represented, on medals, naked. The imagination, it was supposed, must be awed, and kept from taking liberties, by the consideration of the divine character.

GODEAU, ANTHONY, in *Biography*, was born at the city of Dreux in the year 1605. He was educated for civil and active life, but having met with a disappointment in the object of his affections, he repaired to Paris, where

he cultivated the society of men of letters, and was one of the first of those who established the French academy of belles lettres. This society suggested to the cardinal Richieu the foundation of the French academy, of which M. Godeau was an original member. He took orders in the year 1735, and having enriched his own mind with the most pure maxims of Christian morality, he taught them from the pulpit with much eloquence, and he is said to have practised them in all his actions. In the year 1636 he was, by the influence of cardinal Richieu, nominated to the bishopric of Grasse, and from this time he divided his time between his studies, and the diligent discharge of his episcopal functions. He found the state of ecclesiastical discipline exceedingly relaxed, and set about its reformation; he personally examined the qualifications of the clergy, and enquired in what manner they discharged the important duties of their office; he frequently preached in different parts of his diocese, and exhibited in his own life an admirable model of those virtues which he was anxious to recommend to the attention of his flock. He was in high favour with pope Innocent X. who granted him bulls of union of the bishopric of Venice with that of Grasse, but when he found that the people and clergy opposed the measure, he chose rather to give up his pretensions, than break in upon the peace of the church. He died in 1672, at the age of sixty-seven years. He was a considerable writer, chiefly on subjects connected with his profession, but his most important work was "The History of the Church from the commencement of the World to the end of the Ninth Century," in three volumes, folio. This is the first ecclesiastical history written in the French language; and though composed with less precision than that of the abbé Fleury, it possesses considerable merit. It is characterized by Dupin as "exact, faithful and agreeable:" he farther adds, that it always will have a merit, which neither time, nor any other history will be able to efface. Besides the history, we may notice M. Godeau's "Paraphrases on the Epistles of St. Paul;" "The New Testament translated and explained;" "The lives of St. Paul, St. Augustine, and St. Charles Borromeo, &c." Moreri.

GODEFROI, DENYS, a very learned jurist, was born at Paris in 1549. He studied at Louvain, Cologne, and Heidelberg, and upon his return to France acquired a high reputation in the parliament, in which he was nominated to a counsellor's place. In 1580 his religious principles obliged him to seek a refuge at Geneva, where he was admitted a burgher, and a professor of the law. In 1589 Henry IV. created him bailiff of some villages at the foot of mount Jura, and a supernumerary counsellor in the parliament of Paris. After this he was deprived of his employment and his valuable library by the invasion of the duke of Savoy, and in 1594 he accepted the professorship of the law in the university of Strasburg. In 1604, at the invitation of Frederick, elector-palatine, he went to settle at Heidelberg, and in 1618 that prince sent him on an embassy to Lewis XIII., who received him with marks of high esteem. He died at Strasburg in 1622, leaving behind him many works that testify to his great learning. The titles of these are enumerated by Moreri and others, and a few of the principal may be mentioned here: "Corpus Juris civilis cum notis;" this treatise has been frequently reprinted: the best edition is said to be that from the Elzevir press in two volumes folio. "Notæ in IV. Libros Institutionum;" "Praxis Civilis ex antiquis et recentioribus scriptoribus." s.

GODEFROI, THEODORE, the eldest son of the preceding, was born at Geneva in 1580. He pursued his studies first

in that city, then at Strasburg, and afterwards at Paris, where he embraced the Catholic religion. In 1643 he obtained the office of counsellor of state, and acted during the six last years of his life as counsellor and secretary to the French embassy for the general peace at Munster. Here he died in 1649. He was particularly versed in the genealogical and ceremonial history of France, and published several learned works for its illustration; such are "Le Ceremonial de France," 4to. "Mem. concernant la Prefféance des Rois de France sur les Rois d'Espagne;" "De la véritable Origine de la Maison d'Autriche;" "Traité touchant les Droits du Roi Tres-chretien sur plusieurs Etats voisins," &c. Moreri.

GODEFROI, JAMES, brother to Theodore, was born at Geneva in 1587. He followed the steps of his father by a strict adherence to the reformed religion, and by pursuing the studies of law, history, and philosophy. In 1619 he was created professor of the law at Geneva, and was called to a seat in the council in 1629. He filled with the greatest zeal and ability every public office with which he was entrusted. He was five times elected syndic of the republic, and was made secretary of state. He was chosen as a fit person to conduct various negociations in France, Piedmont, Switzerland, and Germany; and, at the same period, he devoted all his leisure to public lectures in jurisprudence, and composed a variety of learned works. He maintained a correspondence with the most learned men of the age, by whom he was greatly respected. He died in 1652, and his works bear testimony to his profound erudition, and to his great and unwearyed industry; among them may be mentioned "Fragmenta Duodecim Tabularum;" "Animadversiones Juris Civilis;" "De Jure Præcedentiæ;" "Codex Theodosianus," a posthumous work, regarded as a most valuable monument of ancient jurisprudence. He edited the works of Cicero, "cum notis Lambini et Gothofredi." He had likewise made large collections for the history of Geneva, which were afterwards used by Spon. Moreri.

GODEFROI, DENYS, son of Theodore, born at Paris in 1615, was an able French historian. He was author of "Memoires et Instructions pour servir dans les Negociations et les Affaires concernant les Droits du Roi," a work, which has sometimes been attributed to the chancellor Seguier, by whose order it was compiled. He re-edited many of his father's works, adding to them new illustrations with learned notes. He continued to his own time Féron's "Hist. des Officiers de la Couronne." As a public man he was appointed in 1668 the director and keeper of the chamber of accounts at Lille in Flanders, where he died in 1681. Moreri.

GODEFROI, JOHN, son of the preceding, succeeded his father in the direction of the chamber of accounts at Lille, where he died, much advanced in years, in 1732. He published an edition of the "Memoirs of Philip de Comines," in five volumes 8vo. "The Journal of Henry III." "The Memoirs of Queen Margaret." He is said to have contributed more than any other writer to the elucidation of the affairs of the League. Moreri.

GODERVILLE, in *Geography*, a town of France, in the department of the Lower Seine, and chief place of a canton, in the district of La Havre; 9 miles N. E. of Montvilliers. The place contains 650, and the canton 12,539 inhabitants, on a territory of 150 kilometres, in 31 communes.

GODESCHALC, in *Biography*, a Benedictine monk, who flourished in the ninth century, was born in Saxony, and was brought up, contrary to his own inclination, to the

profession, in the convent of Iulda. He was ordained priest when he was about forty years of age, and in 846 we find him at Rome visiting the holy places there; thence he proceeded to Pannonia and Dalmatia, where he commenced preaching the doctrine of predestination with much fervour, which it is supposed he imbibed from the works of St. Augustine. Upon his return to his own country he had a conference with Nothingus, bishop of Verona, before whom he maintained that God, from all eternity, had pre-ordained some to everlasting life, and others to everlasting punishment and misery. Nothingus, astonished and terrified at so daring, and, as he thought, impious a position, complained of it to Rabanus, archbishop of Mentz, who undertook to confute his error, in writing. Dissatisfied, perhaps, with his own arguments, Rabanus summoned a council to meet at Mentz, in the year 848, to which, however, Godeschalc presented a justification of his opinions, and resolutely persisted in maintaining them to be consistent with the scriptures and the sense of the orthodox fathers. The council passed sentence of condemnation upon him, and sent him prisoner to Hincmar, archbishop of Rheims, within whose jurisdiction he had received the priesthood. Hincmar, who was devoted to the interest of Rabanus, assembled a council in 849, in which the monk was a second time condemned, and rendered liable to a punishment repugnant to all the principles of religion and humanity. Godeschalc, however erroneous his sentiments might be, was not to be intimidated; he believed what he asserted, and he firmly adhered to the doctrine in spite of the higher powers. Hincmar accordingly proceeded to put the sentence into execution, degraded the monk from the priesthood, and ordered him to be scourged with the utmost severity. It appears that he was not prepared for so grievous a trial of his fortitude; the force of the pains inflicted on him obliged him, in compliance with the dictates of his persecutors, to throw into the fire the justification of his opinions which he had delivered into the council. The infamous persecutors were not contented with this triumph; they committed him close prisoner to the monastery of Hautvilliers, in the diocese of Rheims. In this, as in every other case of a similar kind, the sufferings of Godeschalc gained him followers and adherents, and many became advocates for his cause. A considerable schism was produced in the Latin church. Some confined themselves to the defence of his person and conduct, while others employed all their zeal and talents in the vindication of his doctrine. The spirit of the controversy ran so high between the contending parties, that Charles the Bald, in 853, summoned the council to meet at Quiercy. Here the suffering monk was again condemned, but the decrees of this council were declared null and void, and Godeschalc and his doctrine vindicated and defended, in a council at Valence, in Dauphiny, in 855, the decrees of which were confirmed in the council of Langres, and in that of Toufi. Such was the origin of the disputes concerning the doctrines of predestination and grace, which, from time to time, have divided the Catholic world into two parties, and which have subsisted in full force among the Protestants. The unfortunate Godeschalc died in prison about the year 860, maintaining with his last breath the doctrine for which he had suffered. The only writings of this monk that have come down to the present times are, two "Confessions of Faith," inserted in archbishop Usher's "Historia Godeschalcæ," printed at Dublin in 1641; an epistle to Ratramnus, published in Cellot's "Historia Godeschalcæ," at Paris, in 1655, and some fragments of other pieces, noticed by Cave. Godeschalc has immortalized his name by setting on foot the controversy

controversy to which we have referred, and by his sufferings in vindication of his favourite doctrine. In the year 1650, the celebrated Maguin published at Paris, in two volumes 4to. a collection of the early treatises produced on both sides of this controversy, entitled "Veterum Auctorum qui nono seculo de Prædestinatione et Gratia scripserunt, &c."

GOD-FATHERS, and GOD-MOTHERS, persons who direct and attend at the baptism of infants, or other persons; who give the name, and who become sureties for the faith and good conduct of the infant baptized. Hence they are called *sponsors*, or more commonly *sponsors*. To this purpose Dr. Nichols, (Def. part ii. p. 273.) says, that "the sureties in baptism religiously engage for the faith of the baptized; that they shall sincerely believe all that is revealed in the gospel, and shall direct the subsequent actions of their lives by the laws of Christ." Against this practice Protestant dissenters have alleged, that the parents, to whom both God and nature have committed the education of their child, are the proper persons to stand forth at its baptism, and take upon them this great and important trust; and to bind themselves by a solemn vow faithfully to discharge it. They object to the order and practice of the established church, that without sufficient authority from reason, or scripture, or the ancient practice of the Christian church, parents are set aside in this solemnity, and forbidden to stand forth, and take upon them this great charge to which God hath called them. For the 29th canon expressly commands, "that no parent shall be urged to be present at his child's baptism, nor be admitted to answer as god-father for his own child." They also object, that the forms of the church should require other persons to appear instead of the parents, and to take upon them this important trust, and most solemnly to promise before God and the church the performance of that, which few of them ever do, or perhaps ever intended to perform, or are capable of performing. It has been pleaded, and even generally allowed, that sponsors in baptism were not known or thought of in the primitive apostolic church. Tertullian, who lived about A.D. 200, seems to have been the first of all Christian writers who mentions persons of this description: "What necessity is there," says he, (De Baptism.) "that sponsors should expose themselves to danger, who, through death, may fail of the performance of their promises, or may be deceived by the wicked disposition of those for whom they promise." "Whether the use of sponsors was from the apostles' days," (says lord King, in his Enquiry into the Constitution, &c. of the Primitive Church,) "I cannot determine, unless the negative may be conjectured from Justin Martyr, Tertullian's senior by 50 years, who, when he enumerates the method and form of baptism, says not one word of sponsors or god-fathers, as may be seen in his second apology, p. 93, 94." St. Austin, one of the earliest of Christian writers who mention sponsors, who lived about A.D. 390, informs us when, and upon what occasion, these sponsors were admitted: "A great many," says he, "are offered to baptism, not by their parents, but by others, as infant-lives are sometimes offered by their masters; and sometimes when the parents are dead, the infants are baptized, being offered by any who can afford to shew this compassion to them. And sometimes infants, whom their parents have cruelly exposed, to be brought up by those who fight on their side, are now and then taken up by the holy virgins, and offered to baptism by them who have no children of their own, nor design to have any." Upon these words of Austin, Dr. Wall ingenuously confesses, (Hist. Brit. Bapt. vol. i.) "Here we see the ordinary use there was

for parents to answer for the children; but yet that this was not counted so necessary, as that a child could not be baptized without it." Hence it has been inferred, that parents were never set aside, when they were capable and willing to offer their children; and that only in cases of the incapacity of parents, were sponsors admitted; and in all such cases, provided that the practice be not enforced as a Christian institution, and as absolutely indispensable, the dissenters, we conceive, could not reasonably object to it. Mr. Wheatly, a well-known writer on the Common Prayer, observes, that the god-fathers and god-mothers of persons baptized at riper years "are only appointed as witnesses of the engagement, and undertake no more than to remind them hereafter of the vow and profession, which they made in their presence." And yet our church catechism expressly asserts, and repeats the assertion, that the sponsors, engaging for infants, engage that they shall believe and repent; for the infants are said to promise both these things by their sureties. Free and Candid Disquisitions, p. 131.

The number of god-fathers and god-mothers is now reduced to three in the church of England, and two in that of Rome: anciently, they had as many as they pleased.

The Romanists have also god-fathers and god-mothers at their confirmation. They even give god-fathers, &c. to bells, at their baptism.

Among the ancients it was the custom for persons of quality to have others of like quality cut their children's hair the first time; by which they became reputed a sort of god-fathers: and the like was practised with regard to the hair of the beard.

GOD-FATHER was also a name anciently given to a kind of seconds, who attended and assisted the knights in tournaments, or single combats.

The god-fathers of duels were a kind of advocates, who were chosen by the two parties, to represent the reasons of their combat to the judges.

Something of this kind was long retained at solemn carousals. There were two or more in each quadrill. See QUADRILL.

The institution of god-fathers and god-mothers, *patrini* and *matrini*, is originally Roman. They are said to have been people who, in the games of the Circus, attended the chariots, shows, and images, of the gods. Cicero makes mention of them, in his oration De Haruspicum Responsis. Their office was much like that of the children in some Romish ceremonies, who are dressed in the habit of angels, and strew flowers, bear incense-pots, lights, &c. and accompany the relics and images of saints.

GODFREY of Bouillon, in *Biography*, celebrated for the part which he took in the first crusade, and king of Jerusalem, was the son of Eustace II., count of Boulogne. The appellation of Bouillon was derived from his lordship of that name in the Ardennes. In his youth he served in the armies of Henry IV., who, as a reward of his valour and fidelity, conferred upon him the title of duke of Lorraine. When the religious enthusiasm of the times set on foot an expedition for the recovery of the Holy Land from the possession of the Saracens, Godfrey was one of the earliest and most illustrious of the princes who took the cross. The command of the principal army was entrusted to his care, and it is agreed that none among the leaders were actuated by purer motives than Godfrey. He gave a distinguishing proof of the disinterestedness of his conduct, by sacrificing almost all his property to defray the necessary expenses of the expedition. Godfrey set out in the autumn of 1096, and proceeded with his host through Germany

and Bulgaria, taking care to abstain from those acts of hostility and rapine which characterized, and had caused the destruction of the fanatics of Peter the Hermit. It was not till June 1099, that Godfrey was able to lay siege to the renowned city, and though his army was greatly diminished in point of numbers, he was able to succeed, and on July 15th Jerusalem was taken by storm. The fanaticism and madnets of the victors indulged themselves in a horrible massacre of the vanquished, which, it is believed, their general and leader was unable to prevent. Godfrey was almost immediately proclaimed sovereign of the new acquisition, but he refused to assume the title and ensigns of royalty in the place where Christ, in whose cause he was acting, had been crowned with thorns, and he governed under the modest appellation of "Defender and Baron of the Holy Sepulchre." He was soon after attacked by the sultan of Egypt, but the Christians soon put him and his numerous forces to flight, and the whole of Palestine was reduced under the power of Godfrey. He established the feudal institution in his kingdom; and a code of jurisprudence, under the title of "The Assize of Jerusalem," gave a model of the purest form of European liberty in the midst of Asiatic despotism. He died, after he had sat on the throne about a year, and was succeeded by his brother Baldwin. The celebrity of Godfrey is immortalized as the hero of Tasso's "Jerusalem Delivered," one of the noblest of epic poems; nor has the bard found it necessary to borrow the colours of fiction, in order to throw splendour round a character so truly estimable: "Godfrey," says the historian in describing his character, "was the first who ascended the walls of Rome, and his sickness, his vow, perhaps his remorse for bearing arms against the pope, confirmed an early resolution of visiting the holy sepulchre, not as a pilgrim, but a deliverer. His valour was matured by prudence and moderation; his piety, though blind, was sincere, and in the tumult of a camp he practised the real and fictitious virtues of a convent. Superior to the private factions of the chiefs, he reserved his enmity for the enemies of Christ; and though he gained a kingdom by the attempt, his pure and disinterested zeal was acknowledged by his rivals." Gibbon Univer. Hist. See also the article **CROISADE**.

**GODFREY** of Viterbo, an Italian historian of the 12th century, was chaplain and secretary to the emperors Conrad III., Frederick I., and Henry IV. According to his own account he was a great traveller for knowledge; and was conversant in several languages. His principal work was a "Chronicle," entitled the "Pantheon," as treating on the "Gods of Earth," is dedicated to pope Urban III., and is a general historical record from the creation of the world to the year 1186. It is written in the Latin language, and is deemed very worthy of credit for the events of his own time. It was first printed at Basil in 1559; then at Frankfurt in 1584, and afterwards at Hanover in 1613, in the collection of German historians, edited by Pillorius. Godfrey was author of a work intitled "Speculum Regum, sive de Genealogia omnium Regum:" the MS. is preserved in the Imperial library of Vienna.

**GOD-GILD**, in our *Ancient Customs*, that which is offered to God, or for his service.

**GODHILLAH**, or **GOOD HOPE**, in *Geography*, a settlement in West Greenland. N. lat. 64° 25'. W. long. 50 10'.

**GODIN**, **Lotis**, in *Biography*, was born at Paris in 1704. He studied astronomy under de Piffes, and in 1725 was made adjunct of the Academy of Sciences. To him was entrusted the care of editing its memoirs, and under his direction the first eleven volumes were published. In 1735 he was sent, with other members of the academy, to measure a degree of the meridian at Peru. He was some time professor of mathematics at Lima, and on his return in 1751, he was appointed a colonel in the Spanish service, and director of the naval academy at Cadiz, where he died in the year 1760. He was author of several astronomical papers in the memoirs of the academy from 1726 to 1739; and he published "Machines et Inventions approuvées par l'Académie des Sciences," in 6 vols. 4to. "Connoissances des Temps," which he conducted five years. "Cours des Mathématiques," 1756. Gen. Biog.

**GODING**, or **HOBONING**, in *Geography*, a town of Moravia, in the circle of Brunn; 15 miles E.S.E. of Auspetz.

**GODO**, a town of Arabia, on the S. coast of the Persian gulf; 140 miles W. of Julfar.

**GODOUA**, a small town of Fezzan; 30 miles N. of Mourzonk, and about the same distance from Sebbah, which see.

**GODRA**, a town of Hindoostan, and capital of a circle of the same name in Guzerat; 55 miles E. of Amedabact. N. lat. 22 50'. E. long. 73° 40'.

**GOD'S HOUSE**, *League of*, a territory of Switzerland, formerly under the dominion of the bishop of Coire, until the people, oppressed by their rulers, threw off the yoke, and, forming a general league, compelled the bishop to ratify their independence. The revolution, which finally exalted this league into its present state of freedom, probably took place between 1424, the era of the formation of the Grey league, and 1436, the year in which the ten jurisdictions rose into independence. This league is denominated in Romanth "La Lìgia de la Chiada," in German "Gottshausband," whence is derived the appellation of the "league of the house of God," which it takes from the cathedral situated in its capital, as well as because it was once under the jurisdiction of the bishop of Coire. This league is divided into eleven districts, each of which (Coire excepted) is subdivided into two little republics, or communities, and sends 22 deputies to the general diet. Formerly the burgo-master of Coire was perpetual chief of the league without election; but in the latter end of the 17th century the other communities claimed a power of nominating to this office in their turn. At length, by the arbitration of Zurich, it was decided, that the 22 deputies should chuse two candidates from the members of the senate of Coire, who should draw lots for the charge. The chief thus appointed is called "Bunds-president," has several privileges which distinguish him from the chiefs of the two other leagues; he receives all the letters addressed to the republic of the Grisons from foreign powers, and is perpetual president of the congress, because that assembly is always held at Coire. See **COIRE**.

The league of God's house is divided into 11 high jurisdictions, and comprehends 21 communes.

High Jurisdictions.	I. Coire	-	-	-	Communities.	1. Coire	-	-	-	Members of General Diet.	2
	II. Pregalia	-	-	-		2. Sopra Porta	-	-	-		1
	III. Upper Engadina	-	-	-		3. Sotto Porta	-	-	-		1
	IV. Lower Engadina	-	-	-		4. Sopra Fontana Merla	-	-	-		1
	V. Bivio or Stalla	-	-	-		5. Sotto Fontana Merla	-	-	-		1
	VI. Ortenstein	-	-	-		6. Sopra Tafna	-	-	-		1
	VII. Obervats	-	-	-		7. Sotto Tafna	-	-	-		1
	VIII. Oberhaslein	-	-	-		8. Bivio and Marmorara	-	-	-		1
	IX. Pufchiavo	-	-	-		9. Avers	-	-	-		1
	X. Munster	-	-	-		10. Remus, Schlins, and Samun	-	-	-		1
	XI. Four villages	-	-	-		11. Ortenstein	-	-	-		1
				12. Furstenau	-	-	-	1			
				13. Obervats	-	-	-	1			
				14. Breguns	-	-	-	1			
				15. Tinzen and Reamp	-	-	-	1			
				16. Tiefen Casten	-	-	-	1			
				17, 18. Valley of Pufchiavo	-	-	-	2			
				19. Valley of Munster	-	-	-	1			
				20. Sitzers, Igis, Tremos	-	-	-	1			
				21. Unter Vatz	-	-	-	1			

God's Mercy, *Ilands of*, three or four small islands at the N.W. extremity of Hudson's straits. N. lat. 63° 45'. W. long. 73°.

**GODWIN, EARL**, in *Biography*, a powerful Saxon baron, was the son of Wolfnoth, governor of Suffex, and he himself, at the accession of Canute, was earl of Kent, and lord of very great possessions. When the Danish possessions of Canute were attacked by the king of Sweden, Canute took over as auxiliaries a body of English commanded by the earl of Godwin, who obtained a complete victory, which so delighted the king, that he bestowed his daughter in marriage upon him, made him large grants of land, and admitted him to the closest confidence. After the death of Canute, the succession being disputed between Harold Harefoot and Hardicanute, Godwin espoused the part of the latter, and was instrumental in preventing a civil war. It is reported that he afterwards concurred with Harold, in a plan for destroying the two English princes, sons of Ethelred II. and Emma, and the murder of one of them, viz. Alfred, is imputed to the vassals of Godwin. In the reign of Hardicanute the surviving prince Edward preferred an accusation against the earl for the murder of his brother, and loudly demanded justice for the crime; Godwin, to appease the king, made him a present of a galley finely gilt and decorated, rowed by fourscore men, each of whom wore on his arm a gold bracelet, weighing sixteen ounces, and they were all armed and clothed in the most sumptuous manner. Hardicanute, delighted with the spectacle, forgot his brother's murder, and on Godwin's own testimony he was allowed to be acquitted. In 1041, he was so completely reconciled to Edward, that on the death of Hardicanute he was the chief instrument of promoting him to the succession of the crown: he now acquired much influence in the state, and was created duke of Wexsex, and the counties of Kent and Suffex were annexed to his government. The friendship between Godwin and the king was not of long continuance. Upon his refusal to act against the inhabitants of Dover, who had incurred Edward's displeasure, he was threatened with the royal vengeance. The earl, feeling his own power, actually excited a rebellion against his sovereign. Edward now summoned to his aid the dukes of Northum-

berland and Mercia, and being thereby superior to Godwin and his sons, he marched to London and summoned a great council to pass judgment upon the rebels. Godwin, with three of his sons, took refuge with Baldwin earl of Flanders, while Harold and another fled to Ireland. Godwin, after many misfortunes, sailed with a powerful force to London, and forced the king to an accommodation: Edward consented to banish his Norman favourites, who had been, in a great measure, the cause of the discontents, and Godwin and his sons were restored to their estates, and the high offices which they had formerly held. Godwin's death, which happened soon after this, while he was sitting at table with the king, prevented him from making farther inroads on the sovereign's authority, or from reducing him to still greater subjection. He was succeeded in the government of Wexsex, Suffex, Kent, and Essex, and in the office of steward of the household, by his son Harold, who was actuated by an ambition equal to that of his father, and was superior to him in address, in insinuation, and in virtue. With respect to Godwin, his character is blackened by the monkish historians, who pretend that his sudden death was the effect of a miraculous interposition from heaven. With great abilities, Godwin possessed an ambitious spirit, which rendered him a subject of wavering fidelity, and made him but little scrupulous in means that tended to his aggrandizement. *Hume's Hist. vol. i. Biog. Brit.*

**GODWIN, THOMAS**, was born at Oakingham, in Berkshire, in 1517, where he received at the free-school the elements of a learned education. His rapid proficiency in grammar-learning attracted the notice, and secured to him the patronage of Dr. Layton, archdeacon of Bucks, who received him into his house, and took care of his farther instruction. In 1538, he was sent by his friend and patron to Magdalen college, Oxford: here he pursued his studies, and in 1543 he took his degree of B. A. and in the following year he was elected fellow of his college, which rendered him independent of the pecuniary assistance of his friends. His steady regard to the principles of the reformation rendered his situation at college in many respects very uneasy, and he gladly embraced the opportunity of a vacancy in the mastership of the free-school of Brackley in Northamptonshire, which



which was in the gift of the college, to resign his fellowship. He retired to this situation in 1549, and having married, continued there peaceable and happy during the reign of king Edward, devoting what time he could spare from the duties of his office to the study of theology and physic, and on the accession of Mary, he became an object of Bonner's fury, and was obliged to resign his school, and turn his attention to physic. By the practice of this, he maintained his family till Elizabeth ascended the throne. He now resolved to follow the bent of his inclination, devoted his whole time to theological studies, was admitted to holy orders, and appointed chaplain to the bishop of Lincoln. He was shortly after introduced to the queen, who made him one of the Lent preachers. This post, which was probably attended with little emolument, he filled eighteen years, with very high reputation, during which he received no preferment in the church; but, in 1565, he was promoted to the deanery of Christ-church, Oxford, and in the same year a prebend was conferred on him. In 1566, he was advanced to the deanery of Canterbury, and attended the queen in her visit to the university of Oxford, on which occasion he took his degree of D.D. with great applause. In 1584, after eighteen years residence at Canterbury, he was nominated by the queen to the vacant see of Bath and Wells. This honour did not augment the happiness of Dr. Godwin; in resisting the unjust claims of one of Elizabeth's favourites, he lost the favour of the queen herself, which so affected his mind, as to render him incapable of performing his episcopal functions. The affairs of his diocese, being left to the management of others, fell into such disorder, that his metropolitan, archbishop Whitgift, thought proper to visit it in the year 1587. At this time Dr. Godwin's health was in a very bad state, and he gradually became worse till he sunk under the effects of disease, in his seventy-third year. He is highly spoken of for learning and unaffected piety, and was beloved and respected for his cheerful hospitality, benevolence, and charity. *Biog. Brit.*

**GODWIN, FRANCIS**, the son of the preceding, was born at Havington, in Northamptonshire, in the year 1561, and having been carefully educated in grammar learning, he was sent to Christ-church college, Oxford, when he was in his sixteenth year, and in 1578 he was elected a scholar of that institution. In 1580, he took his degree of B.A., and three years after he proceeded to his degree of M.A. About this time he wrote an entertaining philosophical fiction, which he did not at that period publish, because it contained ideas at variance with the systems then prevalent in the schools. It was given to the world five years after his death, under the title of "The Man in the Moon, or a Discourse of a Voyage thither by Domingo Gonzales." The hints, conjectures, &c. contained in this piece, prove that the author was not ignorant of the writings of Copernicus, and was probably a convert to his doctrines. In 1587, he was a canon in the cathedral church of Wells, and promoted to the subdeanery of Exeter. The history and antiquities of his country became favourite subjects of his enquiries, and in the year 1590 he accompanied the celebrated Camden into Wales, in search of objects to illustrate them. In 1595, he took the degree of doctor in divinity, being in possession of very considerable and lucrative preferment in the church. He published, in 1601, "A Catalogue of the Bishops of England, since the first Planting of the Christian Religion in this Island, together with a brief History of their Lives and memorable Actions, so near as can be gathered out of antiquity." As a reward for the great diligence used in the composition of this catalogue, the queen promoted him, the same year, to the

vacant see of Landaff; being allowed to retain, in connection with the bishopric, the subdeanery of Exeter, and a good rectory in the diocese of Bath and Wells. He now employed himself in improving his "Catalogue," and in making collections relative to civil and ecclesiastical history. In 1615 he published a new edition of his "Catalogue," to which he prefixed a discourse "Concerning the first Conversion of our Britain unto the Christian Religion." It was afterwards republished in Latin, under the title of "De Præfulibus Angliæ Commentarius." In the same year he published "Rerum Anglicarum Henrico VIII., Edwardo VI., et Maria, regnantibus, Annales," which was much admired for the elegance of the style. By king James he was translated from Landaff to the bishopric of Hereford in the year 1617, and from this period, he devoted such time as the discharge of his episcopal functions would permit, chiefly to the improvement of his former works; but in 1629 he published a discourse on the several methods of conveying secret and speedy intelligence, with the title of "Nuncius Inanimatus, Utopia." It has been suggested that this was written in obscure and enigmatical language, with a design of concealing the author's secret; but from certain expressions, it should seem, that the hints contained in it might have led to an earlier establishment of public telegraphs. Besides several editions of the *Annales*, and a translation into English of the same work, we have a learned dissertation by the bishop, on the value of the Roman sesterce and attic talent, which was printed at the end of Hakewell's "Apology of Divine Providence." This was his last labour in the field of literature. He died in 1633 in his seventy-second year. Of his learning and classical taste, his works bear most decisive evidence, and they exhibit him as a zealous friend to the establishment, of which he was a member. According to Anthony Wood, "he was a good man, a grave divine, a skillful mathematician, an excellent philosopher, a good preacher, and a strict liver; but so much employed in his studies and matters of religion, that he was a stranger to the world and the things thereof." *Biog. Brit.*

**GODWIN, THOMAS**, a learned English divine and writer on Jewish antiquities, was born in Somersetshire in the year 1587. In his fifteenth year, he was sent from the grammar-school to Magdalen-hall, in the university of Oxford, where he was entered a scholar. Here, in due course, he took his degrees, and soon after was chosen master of the free-school at Abingdon, in Berkshire. In this situation he distinguished himself by his diligence and assiduity in forming good scholars, who afterwards became eminent in various departments of literature, and in posts of honour and emolument in the church and state. In 1613 he published "Romanæ Historiæ Anthologia,"—an English exposition of the Roman antiquities, which went through several editions. Shortly after this, he entered into orders, and was appointed chaplain to Dr. James Montague, bishop of Bath and Wells, and in 1616 he was admitted to the degree of bachelor of divinity, and published a work, entitled "Synopsis Antiquitatum Hebræicarum ad Explicationem utriusque Testamenti valde necessaria, &c." lib. 3. 4to. About this period he resigned his school, upon obtaining a presentation to the rectory of Brightwell, near Wallingford, in Berkshire. In the year 1625, he published the work by which he is chiefly known, viz. "Moses and Aaron; civil and ecclesiastical Rites, used by the ancient Hebrews, observed, and at large opened, for the clearing of many obscure Texts, throughout the whole Scripture." This work was immediately regarded as a standard book in our places of academical education, and has been repeatedly printed. In 1636, Mr. Godwin was admitted to the degree of doctor of divinity. He died

in 1642. Besides the works already noticed, Dr. Godwin was the author of "Florilegium Phraicon,"—or A Survey of the Latin Tongue. And Three Arguments to prove election upon foresight of faith. Gen. Biog.

**GODWIN**, or *Goodwin Sands*, in *Geography*, a bank in the sea, about five miles from Deal, near the coast of Kent, England, were formerly part of the estate of the celebrated earl Godwin, but were separated and overwhelmed by a sudden inundation of the sea, about the end of the eleventh century. These sands are frequently fatal to mariners, but, notwithstanding, are of considerable use, as it is by them alone that the Downs are constituted a road or harbour for shipping. In all easterly winds they serve as a pier, or break-water, and greatly mitigate the force and immensity of the waves, which, in stormy weather, would otherwise roll upon this shore with unabated fury. The sands extend in length about ten miles; the north sand-head being nearly opposite to Ramsgate, and the south sand-head to Kingsdown. The danger of striking upon them arises from their nature, which Mr. Smeaton describes as that of a quick-sand, clean and unconnected, yet lying so close, as to render it difficult to work a pointed bar to the depth of more than six or seven feet. Their ingurgitating property is so powerful, that even the largest vessel driven upon them would, in a few days, be swallowed up, and seen no more. At low-water they are in many parts dry, and parties frequently land upon them; but when the tide begins to flow, the sand becomes soft, and is moved to and fro by the waves. The largest portion of this bank which becomes dry, is known to seamen by the name of the Jamaica island. Some years ago, in order to prevent the many accidents which occur to shipping on these sands, the Corporation of the Trinity-house formed the design of erecting a light-house on them; but after the sand had been penetrated by boring augers to a great depth, the scheme was given up as impracticable, as no solid foundation could be obtained. Floating lights have, however, been placed off these sands, consisting of three distinct lights in the form of a triangle, of which the middle one is considerably the highest; when they are obscured in hazy-weather, a bell is kept constantly ringing.

**GODWIT**, in *Ornithology*. See *SCOLOPAX Egocephala*.

**GODWIT**, *Great*, or *American*. See *SCOLOPAX Fedoa*.

**GODWIT**, *Lesser*. See *SCOLOPAX Limosa*.

**GODWIT**, *Red*. See *SCOLOPAX Lapponica*.

**GODWIT**, *White*. See *RECURVIROSTRA Alba*.

**GOELANS**, **POINT AU**, in *Geography*, a promontory on the N. side of lake Ontario; about 33 miles S. W. of fort Frontinae.

**GOELHEIM**, a town of France, in the department of Monte-Tonnerre, and chief place of a canton, in the district of Kaiferlautern. The place contains 860, and the canton 4999 inhabitants, in 16 communes.

**GOELICKE**, **ANDREW ORTON**, in *Biography*, a German physician, who acquired considerable reputation at the beginning of the eighteenth century, and taught the science of medicine at Halle, in Saxony, and at Franckfort on the Oder, with distinction. His writings were in high estimation among the followers of the doctrines of Stahl, of whom he was one of the ablest defenders. Nothing more is known respecting his life. He left several works, which relate principally to the history of anatomy, of ancient and modern surgery, and of medicine. His "Historia Medicinæ Universalis, quæ celeberrimum quorumcumque Medicorum, qui a primis Artis natalibus ad nostra usque tempora inclaruerunt, vitæ, nominum, dogmata singularia, ratiocinia, hypotheses, sectæ, &c. accurate pertractantur," was printed in six different portions or

epochs, between the years 1717 and 1720. The first four brought down the history to Hippocrates; the fifth treated of the Hippocratic medicine alone; and the last part included a sketch of the descendants of the father of medicine, until the time when the art was divided into three professions. Eloy. Dict. Hist.

**GOELL**, in *Geography*, an island of Denmark, in Lym-ford gulf, about 10 miles in circumference; on which are a town and a village or two; 6 miles W. of Aalborg. N. lat. 57° 5'. E. long. 9° 49'.

**GOELMA**, a port of Egypt, in the Red sea, capable of accommodating only small vessels.

**GOELWARA**, a circle of Hindoostan, in Guzerat, on the W. coast of the gulf of Cambaye.

**GOEREE**, **WILLIAM**, in *Biography*, who flourished in the 17th century, was born at Middleburg, in Zealand, in the year 1635. He had a decided turn for literature, but by the death of his father while very young, he was consigned to the care of an illiterate step-father, who would not permit him to pursue the bent of his mind. Being obliged to fix upon a trade, instead of studying for one of the learned professions, he fixed on that of a bookseller, as that which he imagined best adapted for the improvement of his leisure hours in the acquisition of knowledge. His various works will shew how well he filled his time, and to what advantage he turned those intervals from occupation, which are too frequently spent in listlessness or devoted to pleasure. He died at Amsterdam in 1711, leaving his "Jewish Antiquities," in two volumes, folio. "The History of the Jewish Church," in four volumes folio. "History Sacred and Profane." "An Introduction to Painting." "A Treatise on Architecture;" and some other useful works. Moreri.

**GOERZEOD GHEZERE**, in *Geography*, a town of Asiatic Turkey, in Natolia; 25 miles S. of Sinob.

**GOES**, a town of Portugal, in the province of Beira; 9 miles E. of Coimbra.—Also, a town of Holland, in Zealand, called "Ter-Goes," situated on the N. coast of the island of South Bevelandt, on an arm of the Scheldt, with which it is connected by means of a canal. The great church is a handsome structure; and though the town is not large, it carries on a considerable trade, particularly in salt and grain; 10 miles E. of Flushing. N. lat. 51° 33'. E. long. 3° 46'.

**GOETIA**, *Γοητεια*, a species of magic, opposed to Theurgia, the object of which was mischief; and accordingly it invoked only the malevolent geni.

**GOEZ**, **DAMIANA**, in *Biography*, a learned Portuguese, of the 16th century, was born at Alenquer, and educated in the court of the king Emanuel, to whom his brother was gentleman of the chamber. He was, as he advanced in life, employed in various negociations from his court to the court of France, Germany, Poland, and the Low Countries. In 1534, we find him at the university of Padua, in which he studied some years under Buonamico, and contracted a friendship in Italy with Bembo, Sadolet, and other great men. He carried forward his studies at Louvain, where he fixed his residence after his marriage, and was the principal means of defending the city against the attack of Martin van Rossem. He was, however, seized by the enemy, under the pretence of a violation of the truce, and obliged to ransom himself. He was after this recalled by the king of Portugal, who wished to employ him to write the history of that country. The materials put into his hands were in so confused a state, and so scanty in regard to quantity, that he was able to perform but a small part of the talk. He was malignantly accused, arrested, and thrown into prison. At length, as there was nothing found against him, he was liberated, and return-

ed to his own dwelling, where he was shortly after found burnt to death, the consequence, probably, of an apoplectic fit. His works are, "Legatio magni Indorum Imperatoris ad Emanueleum Lusitanæ Regem." "Fides, Religio, Moræque Æthiopum." "Hispaniæ Laudatio." "Urbi Lovaniensis Obsidio." "Comment Rerum Cesarum in India à Lusitanis." "Urbi Ulyssiponenis Descriptio." "Historia del rey Dom. Manuel." "Chronica de Principe D. Juao II." Moreri.

GOEZE, JOHN AUGUSTUS EPHRAIM, was born at Mülchen in the year 1731, where he received the elements of a learned education. He was afterwards sent to Halle to pursue his studies preparatory to the exercise of the profession of preacher. In 1751 he settled in that capacity at Quedlinburg, which he retained till the period of his death. It was not till he was about forty years of age that he turned his attention to the microscope and natural history, for his skill in which he afterwards became so famous. At first he made use of his microscope only for amusement, but in a short time he possessed himself of the very best instruments of the kind that had been manufactured, and his researches led him to the study of the natural history of insects. Baker's description of certain water insects induced him to explore the ditches, rivulets, and ponds. He wrote down his observations for his own private use, and caused many of the objects which he saw to be delineated. The facts thus collected he published in the Hanoverian magazine, which attracted the notice of the learned, from whom he received many flattering and highly complimentary letters on the subject. He translated Bonnet's treatise on insectology, which met with a very favourable reception from naturalists. He set out without regard to system or order, but soon found that systematic knowledge was necessary in his pursuits; and completely acquainted himself with the Linnæan arrangement; and his "Entomological Collections" were intended as a supplement to the works of the Swedish naturalist. The next considerable work of Goetze was on the natural history of intestinal worms, which he published in quarto in 1782. This work contributed greatly to increase his reputation as a naturalist, and entitles him to an honourable place among the discoverers of modern times. The interest which he took in the education and improvement of his own children led him to publish some works on natural history, intended particularly for young persons in general, and being a very agreeable as well as learned writer, his productions were all well received, and to his honour it must be spoken that he never forgot to inculcate the duties of religion and morality while he was descending on the wonders of the natural world. After he had communicated to the public the result of his observations on intestinal worms, he sent his collection to Pavia, where it was sold for a thousand dollars. His fame, however, had extended much beyond his own country, and within a very few weeks after he had parted or at least agreed to part with his curious collection for the above named price, he received a letter from Dr. Hunter, offering him nearly double the sum for it. He died in June 1786. Gen. Biog.

GOFABAD, in *Geography*, a town of Persia, in the province of Irak: 55 miles E. of Haham.

GOFFE. See GEOFF.

GOFFSTOWN, a town of America, in Hillsborough county, New Hampshire, situated on the western bank of Merrimack river, 3 miles from Amulkeag falls, or 65 miles W. of Portsmouth. It was incorporated in 1761, and contains 1612 inhabitants.

GOG and MAGOG, in *Scripture History*, are names gene-

rally connected in the sacred writings. (See Ezek. xxxviii. 2, 3, &c. xxxix. 1, 2. Rev. xx. 8.) Moses (Gen. x. 2) speaks of Magog, the son of Japheth, but says nothing of Gog. According to Ezekiel, (ubi supra,) Gog was prince of Magog; the latter signifying the country or people, and the former, the king of it. The ancients generally represent Magog as the father of the Scythians or Tartars; and traces have been found of the name in the provinces of Great Tartary. Others say that the Persians are descendants of Magog; and to this people have been found those called Magushians, and phisians, called Magoi or Magi. Some have imagined that the Goths were descended from Gog and Magog; and that the wars described by Ezekiel, and undertaken by Gog against the East, are those which the Goths carried on, in the 5th century, against the Roman empire. Bochart has placed Gog in the vicinity of Caucasus; and he derives the name of this celebrated mountain from the Hebrew גִּיגִי, gog-gahim, the father of Gog. He also says, that Prometheus, said to be chained to Caucasus, is Gog; and it may be observed, that there is a province in Iberia S. of Caucasus, called the Gogarene. Most persons are of opinion, that Gog and Magog, in Ezekiel and the Revelations, are taken, allegorically, for such princes, as were enemies to the church. Accordingly many, by Gog in Ezekiel, understand Antiochus Epiphanes, the persecutor of the Jews; and Gog in Revelation, they suppose to represent Antichrist. Calmet apprehends that the Gog of Ezekiel and Canbyse, king of Persia, were the same persons. The Arabians are of opinion that the descendants of Gog and Magog inhabit the northern parts of Asia, beyond the Tartars and Sclavonians: and hence it is probable that Gog and Magog, according to the notions of the Arabians, formerly inhabited the mountains of the Hyperboreans, and that they were known to the ancients by this name. This nation is unquestionably famous in antiquity, and there is reason for imagining, that they were some of the Scythians, and confounded among the Great and Little Tartars, and perhaps among the Muscovites, and other northern people. Calmet.

Gog-Magog Hills, in *Geography*, hills so called, about three miles from Cambridge, remarkable for the intricate ments and other works found there, and supposed by some to be a Roman camp, and by others, a work of the Danes.

GOGA, a town of Abyssinia: 30 miles S. of Gondar—Also, a small town of India, on the western side of the gulf of Cambaya, about 28 or 30 leagues from Cambay, abounding with banians and sea-men.

GOGARD, a town of Sweden, in the Götaland: 23 miles N.N.W. of Linköping.

GOGARENA, in *Antient Geography*, a country of Asia, in Armenia. Strabo.

GOGARY, in *Geography*, a town of Bengal: 24 miles N.W. of Boglipour. N. lat. 25. 20. E. long. 87. 36.

Also, a town of Hindoostan, in Bahar: 15 miles N. E. of Moughir.

GOGAVINUS, ANTONIUS GRAVENSIENSIS, AN. 1601. GOGAVIN DE GRAVE, in *Geography*, a philosopher and poet, who, according to the inscriptions of the famous library, published in 1679 all the ancient authors on medals at Venice, 1562, 4to.

His compilation contains the books of Anaxagoras and Ptolemy, and the fragment of Armetheus, and the Commentary of Perphyry, the whole enriched with notes of Bottrigari. See METRONIUS, and PERPHYRIUS.

GOGET, in *Antiquity*. See GOGUET.

GOGGLES, in *Real History*, a kind of affliction. See GOG.

Sheep, which is sometimes extremely destructive to them. It is suggested in the Bath papers as first shewing itself, by a dropping of the ears, and frequent rubbing of the tail; but not to have any relation or affinity to giddiness, as the sheep do not run round as in that disease. It appears to have the greatest resemblance to the disorder called the flaggers in lambs; but differs inasmuch, as that the flaggerly lambs display weakness before, and of course fall in that direction, while the goggly sheep shew weakness behind, and when forced to run fall backwards. Sheep under this disorder constantly get poorer and poorer, and become more weak, until they are not able to drag their limbs after them, and consequently die. Some have contended that it is a disease of the paralytic kind, and that the seat of the complaint is in the spinal marrow. It was formerly either wholly unknown, or unattended to by sheep-farmers, as it is never mentioned.

Hitherto no satisfactory method of cure has been pointed out for the disease, but warmth and frequent change of pasture have been found beneficial in it.

GOGGLES, in *Surgery*, are instruments used for curing squinting, or that distortion of the eyes which occasions this disorder. They are short conical tubes, composed of ivory stained black, with a thin plate of the same ivory fixed in the tubes near their anterior extremities. Through the centre of each of these plates is a small circular hole, about the size of the pupil of the eye, for the transmission of the rays of light. These goggles must be continually worn in the day-time, till the muscles of the eye are brought to act regularly and uniformly, so as to direct the pupil straight forwards; and by these means the cure will be sooner or later effected. Warner on the Eye, p. 32.

GOGMOW, in *Geography*, a town of Hindoostan, in Oude; 35 miles N. of Maniakpour.

GOGO. See GOGA.

GOGODUNGA, a town of Bengal, on a small island formed by a branch of the Hoogly; 45 miles S. of Calcutta.

GOGOROMOW, a town of Guzerat, on the coast; 50 miles W. S. W. of Noanagur.

GOGRA, also called *Dewab* and *Soorjeev*, a river of Hindoostan, which proceeds from a lake named Lanke-Dhe, having to the E. of it another larger lake, named Manfawar, both situated on the western side of Thibet, and forces its way through the vast ridge called Himmakch, and afterwards joins the Ganges. See DEWAR.

GOGUET, ANTONY-YVES, in *Biography*, was born at Paris in 1716, where his father was an advocate. He himself became a counsellor to the parliament. By close study and by great assiduity in his pursuits, he produced in the year 1758, a work that has obtained a high reputation, and which has been translated into the English and other languages. It is entitled "Origine des Loix, des Arts, des Sciences, et de leur Progres chez les anciens Peuples," in three volumes 4to. It was printed in 1778, in six volumes 12mo. This work treats of the origin and progress of human knowledge, from the creation to the age of Cyrus, and displays much erudition in historical discussions, though less of science and philosophy than might have been expected. He died of the small-pox almost immediately after the publication of this valuable work. He was a man of much private worth, modest and unassuming. He had begun another work on the Origin and Progress of the Laws, Arts, Sciences, &c. in France, from the commencement of the monarchy.

GOHANNA, in *Geography*, a town of Hindoostan, in Ballogistan; 54 miles W. S. W. of Delhi.

GOHEE, a town of Hindoostan, in Bahar; 35 miles W. N. W. of Saferam.

GOHUD, a circar of Hindoostan, in the soubah of Agra, lying on the right side of the river Jumna. It is bounded on the N. by the Chumbal, on the E. by Dooab and Oude, on the S. by Bundelcund, and on the W. by Rantampour and Cottah.--Also, a town of this circar, the revenues of which are estimated at 20 or 30 lacks of rupees per annum; 55 miles S. E. of Agra. N. lat. 26 24'. E. long. 78 44'.

GOJAK, a town of Croatia, on the river Mresnitza; 18 miles S. of Carlstadt.

GOJAM, a province of Abyssinia, about 80 miles in length, and 40 in breadth. It is a very flat country, altogether appropriated to pasture; it has few mountains, but these are very high, and are chiefly on the banks of the Nile, to the south, which river surrounds the province. Gojam is full of great herds of cattle, which are the largest in the high parts of Abyssinia. The country is populous, but the men are in the lowest estimation as soldiers. The Jesuits were settled in many convents throughout the province, and are held in the utmost detestation. The monks are those of St. Eustatius, which may be called the Low Church of Abyssinia; they are said to be much inclined to turbulence in religious matters, and are, therefore, always made tools by discontented people who have no religion at all. On the S. E. of Gojam is Damot; which see. Bruce.

GOJAS. See GOYAS.

GOJAVA, a town of Africa, on the Grain coast; 25 miles S. E. of Grand Sesto.

GOJEIDA, or GOGIDA, a town of Algiers; 90 miles S. E. of Oran.

GOING, in the *Manege*, called in French *allure*, is the pace or gait of a horse.

GOIT, GURT, *Gorb*, *Leat*, &c. are names for a ditch or trench for conveying water, used by engineers and miners of different districts.

GOITO, in *Geography*, a town of Italy, in the department of the Mincio, situated on the river Mincio, between the lake of Mantua and that of Garda; 9 miles N. N. W. of Mantua.

GOITRE, or GOTTIER, in *Surgery*, names sometimes applied to a morbid enlargement of the thyroid gland. See BRONCHOCELE.

Persons labouring under this complaint are found in various mountainous districts of Europe, in China, in Bootan, and many other regions of the East, in Sumatra, &c. (See CRETINS.) Turner, in his "Account of an Embassy to Tibet," says, that in Bengal this unsightly tumour is known by the name of "Gheig," and "Aubi," and in Bootan is called "Ba," or "Ke Ba," the neck-swelling, and that it forms itself immediately below the chin, extending from ear to ear, and sometimes growing to such an enormous size, as to hang from the throat down upon the breast. It is particularly observable, he says, among the inhabitants of the hills of Bootan, immediately bordering upon Bengal, and in the tract of low country watered by the rivers that flow from them to the south, beyond the space of a degree of latitude. The same malady prevails among the people inhabiting the Morung, Niyah, and Almora hills, which, joined to those of Bootan, run in continuation, and bound to the northward, that extensive tract of low land embraced by the Ganges and the Berhampooter. The same disease is also more particularly met with in the low lands adjoining to these hills. From the frontier of Assam, N. lat. 27. E. long. 91; it is to be traced through Bijne, Gouch Bahar, Rungpore, Dinagepore, Purnea, Tirreoto, and Betiah,

along the northern boundary of Oude, in Gooracpore, Barraitch, Pillibeat, and on the confines of Rohileund, to Hurdwar, situated in N. lat. 30°. E. long. 78° 25'. It has the effect, he adds, or rather is accompanied with the effect, arising from the same cause, of debilitating both the bodies and the minds of those who are affected with it. Marsden, in his "History of Sumatra," observes, that it has been usual to attribute this affection to the badness, thawed state, mineral quality, or other peculiarity of the waters: "My experience," he adds, "enables me to pronounce without hesitation, that the disorder, for such it is, though it appears here to mark a distinct race of people, (*orang goonong*.) is immediately connected with the hilliness of the country, and, of course, if the circumstances of the water they use contribute thereto, it must be only so far as the nature of the water is affected by the inequality or height of the land. But in Sumatra neither snow nor other congelation is ever produced, which militates against the most plausible conjecture that has been adopted concerning the alpine goitres. From every research that I have been enabled to make, I think I have reason to conclude, that the complaint is owing, among the Sumatrans, to the fogginess of the air in the vallies, between the high mountains, where, and not on the summits, the natives of these parts reside. I before remarked, that between the ranges of the hills, the "cahoot," or dense mist, was visible for several hours every morning; rising in a thick, opaque, and well-defined body, with the sun, and seldom quite dispersed till afternoon. This phenomenon, as well as that of the wens, being peculiar to the regions of the hills, affords a presumption that they may be connected; exclusive of the natural probability that a cold vapour, gross to an uncommon degree, and continually enveloping the habitations, should affect with tumours the throats of the inhabitants. I cannot pretend to say how far this solution may apply to the case of the goitres, but I recollect it to have been mentioned, that the only method of curing these people is by removing them from the vallies to the clear and pure air on the tops of the hills; which seems to indicate a similar source of the distemper with what I have pointed out. The Sumatrans do not appear to attempt any remedy for it, the wens being consistent with the highest health in other respects."

**GOKAUP**, in *Geography*, a town of Hindoostan, in Viliapour; 16 miles S.S.E. of Raiboug.

**GOKIA**, a town of Turkish Armenia; 30 miles E.S.E. of Akalzike.

**GOLABAD**, a town of Persia, in the province of Irak; 45 miles E. of Ispahan.

**GOLAH**, a town of Hindoostan, in Bahar; 10 miles E. of Ramgur.

**GOLAN**, a town of the duchy of Warfaw; 10 miles N.E. of Posen.

**GOLAPILLY**, a town of Hindoostan, in the circar of Guntoor; 10 miles W. of Isnaconda.

**GOLAWARRY**, a town of Bengal; 48 miles N.W. of Midnapour.

**GOLCONDA**, a province of Hindoostan, part of the possessions of the Nizam, or Soubah of the Deccan, our name, corresponds to the ancient province of Tellingana, or Telling, situated between the lower parts of the courses of the Kuhnah and Godavery rivers; and is bounded on the N. by Berar, on the E. by the Circars, on the S. by the Mysore country and the Carnatic, and on the W. by Dowlatabad and Viliapour. It takes its name from a famous fortress. The kings of this country were, at a former time, immensely rich and powerful; as they maintained in their pay 500,000 soldiers, and derived very large revenues from

their lands, customs of merchandizes and provisions, but chiefly from the diamond mines, for which this country has been singularly famous. The winter in Golconda begins in June with rain and thunder; the rain pouring down, accompanied by violent storms of wind, till the middle of July, with occasional intervals of fine weather. In August, September, and October, the rains again fall, and very much swell the rivers. These rains render the land exceedingly fertile, particularly in fruits. Vines are plentiful, and of the grapes, which ripen in January, they make white wine. Two crops of rice are produced annually, and the country affords other kinds of grain. The capital of Golconda is Hydrabad.

**GOLCONDA** is also the name of a fortress, surrounded by stone walls and deep ditches, which was formerly the residence of the kings of the country. This fortress, on account of its extent, might be denominated a city; a hill rose in the middle of it like a sugar-loaf, and the sides of it were encompassed by the king's palace, which was very large and well situated for air, and which had a good view of Hydrabad. When Auringzebe conquered the kingdom of Golconda in 1687, this fortress was taken by treachery; the king offered to pay a tribute of 3,700,000 rupees, and become the vassal of the conqueror; but he refused, and entered the palace in triumph.

**GOLD**. *Gold*, Germ.; *Guld*, Swed. Dan.; *Or*, Fr.; *Arany*, Hung.; *Soloto*, Russ.

*Mineralogical Description*.—This metal never having been found in a mineralized state, we are acquainted with one species only, namely,

*Native gold*, which is subdivided by Werner into three sub-species, *viz.* *gold-yellow*, *brass-yellow*, and *greyish-yellow gold*. Though this subdivision may appear arbitrary, and not founded on constant characters exclusively belonging to each of the above varieties or sub-species, it is nevertheless entitled to attention, since colour, however unimportant it may be in the classification of earthy fossils, constitutes a character of considerable value in native metallic substances, the range of whose colours is confined to a narrow compass. But also their geognostic relation appears to constitute a distinction, at least between the two first of the Wernerian sub-species; for as to the third, or the *greyish-yellow gold*, its claims to be kept separate from the two others appear doubtful: all we know of it is its being found in small flat particles, along with that mixture of different metals called platinum in grains, of whose colour it partakes in general, and with which it is supposed to have occurred also originally under the same geognostic relations.

1. *Light or Brass-coloured native Gold*. Messing-gelbes gediigen gold of Werner. Its colour is pretty well indicated by its name; but it varies in intensity from what may be called pale-gold yellow to yellowish-silver white. It is also sometimes found with deep-yellow, and with pavonine tarnish.

It occurs massive, disseminated in angular and amorphous particles, but more frequently in films, membranes, and plates even and curled or twisted, and with smooth or drused surface; also capillary, tooth and wire-shaped, shrub and fern-like, and as moniform strings; often imitating reticulated and filigree work; all which forms are generally produced by the aggregation of minute imperfect crystals. Among these, perfect crystals are not unfrequently seen, sometimes single, oftener in groups, on the margin of the plates, &c. The following secondary forms have been observed; the cube; the octahedron; the garnet-dodecahedron; the leucite-dodecahedron with trapezoidal planes. Also modifications intermediate between the cube and the octahedron occur, but they

are scarce. The minute three-sided pyramids, which are often seen to deafe the membrane, and the simple triangular marks on the plates of the Transylvanian native gold, are the results of hurried and disturbed crystallization; the former of them being the solid angles of the cubical, and the latter the rudiments of the octahedral variety.

The crystals are minute (those described by Mr. Esmark as octohedra and cubes of two lines in diameter, have never before been heard of); their surface is always smooth.

Lustre metallic: externally splendid: while that of the grains is sometimes glitening, sometimes approaching to dull; internally it is glimmering and glitening.

The fracture of gold is fine hackly. Its fragments are indeterminately angular.

It is soft, highly flexible, malleable, and ductile.

The specific gravity of pure gold is from 19.253 to 19.640; but that of the brassy-yellow variety, owing to a greater proportion of silver with which it is alloyed, is generally considerably less, though always above twelve.

The light, or brassy-yellow gold, occurs almost always in veins in greywacke, greywacke slate, and newer porphyry; seldom, as the following sub-species, in primitive rocks, or under other circumstances that bespeak a similar remote antiquity.

It occurs chiefly with quartz and iron pyrites, and not unfrequently with grey antimony. Other concomitant substances are, among the earthy fossils, calcareous spar, brown spar, barytes, selenite, and seldom small quantities of bole, lithomarge, and common garnet; of metallic substances, red and vitreous silver ores, (seldom native silver), copper pyrites, grey copper ore, copper green, brown iron stone, galena, green lead ore, blende, with occasional traces of white cobalt, copper nickel, red orpiment, native arsenic, and arsenical pyrites.

2. *Deep or Gold-yellow Native Gold.*—Gold-gelbes geligen-gold of Werner.

Its colour is the highest gold-colour, seldom verging on brassy yellow.

It occurs massive and in small roundish and flattened pieces, as also in grains of various dimensions, detached or disseminated; seldom in particular external forms, such as in leaves and laminae, filiform and mosslike; scarcely ever crystallized: almost all the crystalline forms described by authors belonging to the light-coloured sub-species.

External lustre glitening, sometimes (as in the variety called Spanish snuff) divested of all lustre. Its specific gravity is rather greater than that of the light or brassy-coloured gold, with which it agrees in the remaining characters.

It occurs mostly loose, in alluvial situations, and in the sand of rivers, and, as such, appears to have been originally disseminated in rocks of ancient formation: it is, however, also found in veins in Norway, Siberia, Bohemia, Hungary, in the East Indies, &c. almost always disseminated in quartz, accompanied by iron-pyrites; but nothing is as yet known respecting the age of these veins. At Fatzebay it is found in minutely mosslike external forms, often of a dull powdery appearance, on common quartz sometimes mixed with iron pyrites; in this state it is by the miner called Spanish snuff.

*Geographical situation.*—The following localities comprehend both the sub-species into which native gold is divided by Werner. By far the greater part of that found in Europe belongs to the brassy-yellow sub-species, except the gold of rivers and alluvial soil, which is principally deep yellow, and to which the immense quantities of this precious metal, furnished by the other parts of the world, appear likewise to be referable.

*Europe.*—Hungary, the Banat, and principally Transylvania. In Upper Hungary it occurs in gneiss: at Scheinitz, in Lower Hungary, it is found accompanied with several silver ores, and with galena; at Kremnitz, in and on cellular and shattered quartz, lamellar barytes, with vitreous silver and grey copper ore, copper pyrites, brown spar, &c.; at Oravizza, in the Banat, it occurs filiform and disseminated in pale flesh-red and greenish-white limestone, with white cobalt ore and copper nickel. In Transylvania, the richest country of Europe in this metal, it principally occurs in a kind of clay-porphry of different degrees of freshness, which is the Saxum metalliferum of Born, in grauwacke and grauwacke slate: at Kapnik it is sometimes found with red orpiment: at Stanisha in calcareous spar, mixed with arsenical pyrites, &c.: other places of Transylvania abounding in gold (which is for the greater part brassy-yellow), are Verechpatak, Abrudbanya, Boiza, Offenbanya, Fatzebay, Toplitza, Trefhtyan, &c. Also the rivers, both of Hungary and Transylvania, are richly auriferous; gold sand is found in the Nera, and underneath a stratum of chalk on the plain traversed by this river. The richest river of Transylvania is the Aranioth, and the plain bordering on the river Moroth, contains likewise gold in grains, between a stratum of mould, and another of schistus, neither of which strata is in the least auriferous. Also at Olapian, gold is obtained by washing; it is there mixed with magnetic ironstone, titanium, garnet, and cyanite. The gold of the great rivers of Transylvania is generally of 21 carats, that of Olapian and Roihar is even of 23 carats, six grains.

In Germany it is found in several places, at Johangeorgensstadt in Saxony, in Carinthia, where it accompanies copper-ores, in Tyrol and Saltzburg; but it is only in the last of these districts, or rather in the chain of mountains, separating Tyrol from Carinthia, that gold-mines are worked: in the Zillerthal it is found in various external forms, and accompanied with iron-pyrites, &c. in mica slate. In Bohemia gold occurs in quartz.

Spain is probably very rich in gold; certain it is that considerable gold mines were worked there in former times, and, according to Diodorus Siculus, as far back as the time of the Phœnicians, after whom the Romans undertook to work them; and Pliny informs us, that those nations derived great profit from them. Asturia was the province which furnished most of this metal. After the discovery of America these mines were entirely given up and lost. The Tago and some other rivers of Spain are likewise auriferous.

France has no gold mine that is worthy to be worked: the first discovery of gold in that country was made in 1781, at la Gardette, in the valley of Oisans, in the present department of the Isère: the mine was worked for six years, but the produce in gold and accompanying minerals was too small to compensate for the expence of obtaining them, and, indeed, the loss amounted to upwards of 21,000 livres. It occurs there, with rock crystals and iron pyrites, in gneiss. The sand of several rivers of France is auriferous, such as that of the Arrièze near Mirepoix, the Gardon and Cèze in the Cévennes, the Rhone in the Pays de Gex, the Rhine between Straßburg and Philippsburg, the Saône in the neighbourhood of St Giron, in the Pyrenees, the Garonne near Toulouse, and the Hérault at Montpellier. Also most of the black sand and of the bog-iron found in the neighbourhood of Paris is said to contain a small quantity of gold.

In Piedmont veins of auriferous pyrites and quartz are found near Macugnaga, at the foot of Monte Rosa: which mountain consists of veined granite in horizontal beds. The veins of pyrites and quartz have upon the whole a perpendicular direction, but in some parts they cross each other,

and.



and where this takes place, *grubbi*, or neils, are found which contain the greatest proportion of gold. The proprietor of these mines extracted out of such nests, in no more than twenty-two days, 189 marcs of pure gold, although a hundred weight of the ore yields no more than from 10 to 12 grains of that metal. Formerly upwards of a thousand workmen were employed in these gold-mines; and the proprietors still possess 86 mills, by which from 10 to 12 pounds (of 12 ounces) of mercury impregnated with gold are produced per day. Twelve pounds of mercury contain two marcs of gold. There are likewise several auriferous rivers on the S. side of the Apennine Alps, between mount Rosa and the valley of Aosta, such as the Avanson, which runs from the valley of Challant into the Doire, and where some gold-mines were also worked by the Romans; the Orco, &c.

Sweden has a gold mine at Edsforss in Smoland: the gangue, a brownish quartz, is said to be in a kind of hornblende slate, which also contains the metal disseminated.

Gold has also been found in Great Britain: in Cornwall; at Lead-hills, in Scotland, disseminated in quartz; at Wicklow, in Ireland, under the soil, and in a stream which runs over rocks of clay-slate with veins of quartz. It belongs to the deep yellow variety.

*Asia*—The gold-ores of Siberia are partly of the light coloured, but principally of the deep coloured variety: that of Berezofo, which occurs in pyrites, or rather brown iron stone, and iron spot quartz, and in the rock which serves as gangue to the red lead ore, belongs to the latter. Patrin mentions a specimen of gold in spangles on horn-silver, found in one of the silver mines of Schlangenberg.

The geognostic relation of the gold found in several parts of India, in Japan, the Philippine and Maldivé islands, Sumatra, Borneo, &c. is not known; all the specimens from India, that have come under our inspection, were in the form of small rounded and amorphous particles in quartz, and belonged to the deep yellow variety.

*Africa*—Of the occurrence of gold in this part of the world we know so much, that the greatest part, at least of that which comes to Europe, is deep yellow and in grains. African travellers have made us acquainted with a few of its localities, but not with any particulars relating to its geognostic habitudes. Though the commerce of gold-powder extends almost over the whole of Africa, yet, according to Heeren, there is none to be found in its northern parts. Among the principal African gold mines are those of Kordofan, between Darfur and Abyssinia, mentioned by Browne. The ancients, says Brongniart, appear to have been acquainted with these mines: they considered Ethiopia as a country rich in gold; and we find in Herodotus, that the king of that country exhibited to the ambassadors of Cambyses all the prisoners of war fettered with chains of gold.

A second most considerable district for gathering gold-powder appears to be southward of the great desert of Zahara, in the west of Africa, at the foot of those lofty ridges of mountains on which originate, among many smaller rivers, the Senegal, the Gambier, and Niger. The country of Tombouctou, at the N.E. of these mountains, is, according to Golberry, that which furnishes the greatest quantity of gold which is sold on the west coast of Africa, from the mouth of the Senegal to the Cape Palmas. This gold is found in spangles and small lumps, principally near the surface of the earth, in the beds of rivulets, and always in a ferruginous soil. In some parts of the country the negroes sink something like shafts, but without giving any support to the sides of the pit; nor are they wont to follow up the vein, if any should appear, or to make galleries. The metal is obtained by repeated washing of the earth that includes it. The same country furnishes likewise

the greatest part of the gold carried to Morocco, Fez, and Algiers, by the caravans which, from Tombouctou, travel through the great desert of Zahara. The gold which is brought to Cairo and Alexandria from Senaar comes likewise from these. See Parke's travels, where also an interesting account is to be found of the gold in Manding, and of the process by which the negroes obtain it.

The third principal district of Africa, for collecting gold, is on the S.W. coast between  $15^{\circ}$  and  $22^{\circ}$  S. lat. opposite Madagascar. This gold comes principally from the country of Sofala. According to the relation of some travellers in this part of the world, the gold is found there not only in powder, but likewise in veins. Some are of opinion that the country of Ophir, from whence Solomon obtained gold, was situated on this coast.

*America*—The gold of this part of the world, as far as we are acquainted with it, is so equally the product of the sand of rivers and of alluvial land; but it is also, though rarely, found in veins. South America, particularly Brazil, Chili, and Chili, are the countries that yield most; but some is also found in North America, particularly in Mexico, where it occurs along with silver-ores. The annual produce of these Mexican mines is valued at from 12 to 1500 kilograms. All the rivers of the Caracca,  $10^{\circ}$  north lat. are auriferous.

The gold of Chili, according to Frezier, is lodged in the alluvial formation.

The Peruvian gold occurs in ferruginous quartz; that of Chocho, the richest province in gold in South America, is found as grains in alluvial country, and in rocks belonging to the newest fletz-trap formation. Almost all we know respecting the geognostic situation of the gold of Spanish America, we owe to M. de Humboldt.

Brazil furnishes gold in abundance, and it is from thence that the greatest part actually seen in commerce is brought to Europe. There are, however, properly speaking, no gold-mines in that country; the gold is not found there in veins, but disseminated in sand and other alluvial depositions, out of which it is obtained in the usual manner.

The gold that has been furnished by Brazil within 120 years, may be valued (according to Correa) at 2,400,000,000 of French livres; and, according to other authors, the amount is calculated to be 24,000,000,000 francs. Brongniart. See ORES.

*Observations*—1. It would appear that most writers who adopt Werner's distinction between gold-yellow and iron-yellow gold, have mistakenly described the iron-yellow for the other, and some even speak of "grey-yellow gold from Transylvania." The iron-yellow is said to may be a real malinifide; but if it is not at all adopted, by far the greater part of the native gold of Transylvania and Hungary, and consequently an oil and ironized gold, may necessarily be referred to the iron-yellow class, and that in the kind of rivers to the deep yellow variety, and this not on account of their colour, but, more judiciously, of difference in the chemical composition of metals, but principally on account of the nature and situation in which they respectively occur, and on which point it is as appears to be held by Werner.

2. Iron pyrites certainly not infrequently accompany a portion of gold, in most cases naturally separated and unalloyed, has by some been considered as a species of gold ore; a distinction to which (though such auriferous pyrites are often subjected to metallurgical treatment for extracting the metal, as will be hereafter) it cannot be considered as entitled. See Practice, *Mineralogy*.

The brown cubic crystals from Beresof, in Siberia, which contain grains of gold, are considered by some as decomposed, by others as hepatic pyrites, and by some as brown iron stone in supposititious crystals. Whatever they may be, they are certainly not what Werner means by hepatic pyrites.

3. The native gold of Transylvania is often accompanied, and sometimes incruled, by particles of a pale yellow earthy substance, which was considered by Haquet as an oxyd of gold. Muller and others have described it as iron-ochre, from which, however, it appears to differ both in colour and consistence. It is almost always to be met with in the specimens of native gold from Vereshpatak, but sometimes in such fine particles as to appear merely as a tarnish on the metal. It is to this dust probably that the gold ore, called Spanish snuff, owes its mat, yellowish-brown colour. It deserves further examination.

4. The grey metallic substance occurring as acicular indeterminate crystals, along with the gold of Siberia, in quartz, and which has been described as tellurium, as grey copper ore, &c. appears to be native bismuth.

For the *chemical characters* of gold, and the *uses* to which it is applied, see the sequel of this article.

*Extraction of Gold*—This metal is obtained separate from foreign substances, with which it is mixed by amalgamation with quicksilver. After it has been freed, by pounding and washing, from the stony matter, it is triturated with about ten times its weight of mercury. The more fluid part of the amalgam is forced through leather, while that which is more consistent, and which contains the chief part of the gold, remains. This is subjected to distillation, the quicksilver is separated and evaporated, and the gold remains in a state of fusion. When this metal is found in other ores, they are first roasted, to disperse the volatile principles, and to oxidize the other metals. The gold, which is but little subject to oxydation, is extracted by amalgamation, by cupellation, or other methods adapted to each ore, according to its properties or constituent parts. The metal obtained in these ways is always more or less alloyed, particularly with silver and copper. The first step in its purification is the process of *Cupellation*, to which article in our Cyclopædia the reader is referred for accurate information on this part of the subject.

The gold, after it has been submitted to this process, is often alloyed with silver, which, being nearly as difficult of oxydation, is not removed by the action of lead, and hence the necessity of the operations denominated *Parting* and *Quartation*, which may be explained in a few words.

In *Parting*, the metal is rolled out very thin, and cut into small pieces, which are digested in diluted nitric acid moderately hot. The acid has an action upon, and dissolves the silver, leaving the gold undissolved in a porous mass. When, however, the proportion of silver is very small in comparison of the gold, the latter sometimes protects the former from the action of the acid; in such cases the previous step of *Quartation* is employed, which is so named on account of the proportion of materials employed, *viz.* three parts of silver, with one of gold, and then subjecting the alloy, rolled out, to the operation of the acid. Sometimes they are melted together, and sulphur thrown in, the sulphur combines with the silver, and the gold falls to the bottom. It is observed by Lagrange, that rolling and annealing are operations very necessary to the success of the parting process, and which require some precautions. 1st. The plate must not be too thin, lest it should break in consequence of the motion communicated to it by the action of the acid; if it is too thick the acid could not penetrate to its centre.

2dly. The annealing of the plate, at the same time that it gives pliability, facilitates its being rolled without cracking; it also opens the pores of the metal, which the rolling may have pressed together, and by these means favours the action of the acid.

The process recommended by Bergman is this: first to dissolve it in nitro-muriatic acid; the silver is deposited spontaneously in the form of muriate of silver, which is insoluble; the gold is precipitated in fine powder by the sulphate of iron. Each of the above-mentioned processes is performed in such a manner as to lead to an estimate of the quantity of gold, and also of the different metals with which it is alloyed.

Gold, it is said, by some able French chemists, as Le Sage and Rouelle, exists in the vegetable kingdom, it having, in experiments instituted for the purpose, been extracted from the ashes of certain plants; the quantity, however, being, of course, too trifling to be sought after for practical purposes, it is sufficient merely to mention the fact in this place.

*GOLD, Chemical Properties of.*—Gold melts at the temperature of 32 of the scale of Wedgwood; and what is very remarkable is, that it is more difficult of fusion in the state of filings and grains, than in larger masses; and that the small fragments, even after they are fused, remain in separate globules; and in order to make them run into one mass, a little nitre or borax is thrown into the crucible. Gold, which has only been subjected to a degree of heat barely necessary for its fusion, is brittle after cooling. To preserve its ductility, which, as will be seen farther on, is one of the more important mechanical properties of gold, the temperature must be raised much higher. It is brittle also when it is too suddenly cooled after fusion. By an increase of temperature while the gold is in fusion, it becomes convex on the surface, and when it cools, it sinks, circumstances which are ascribed to the expansion and contraction of the metal. When it is gradually and slowly cooled, it crystallizes in the form of quadrangular pyramids, or regular octahedrons. If the heat be continued while it is in perfect fusion, it seems to undergo a kind of ebullition. This circumstance was noticed by Homberg and Macquer, as well in the application of the burning-glass, as when a small globule of the metal was acted on by the blow-pipe. Macquer asserts that it rose in vapour to the height of five or six inches, and attached itself to the surface of a silver plate, which it completely gilded.

The strongest heat of a furnace, which has been applied to gold in fusion, has been found incapable of producing the smallest change or the least tendency to oxydation; but, by the action of a very powerful burning-glass invented by Tschirnhausen, and which has been described under the article BURNING-GLASS, Homberg found that gold, placed in its focus, not only rose in vapour, but that it was covered with a violet-coloured vitreous oxyd. The experiment was frequently repeated, so as to ascertain the fact most completely. The same thing has been done by means of the electric discharge, by which gold-leaf, placed between two cards, has been converted into a violet-coloured powder. These instances of real oxydation were, at first, regarded, by some who witnessed the experiments, as merely minute mechanical divisions of the metal, but this apparent objection has been removed by the experiments of Van Marum on the combustibility of gold by means of the large electrical machine at Haerlem. A strong electrical shock was passed through a golden wire suspended in the air. It kindled, burned with a perceptible green flame, and was reduced to fine powder, which was dissipated in the air. A similar oxydation has been observed to take place on the gilding in the inside of  
hours,

houses, or on the furniture which has been struck with lightning. The purple oxyd of gold, thus obtained, contains five or six *per cent.* of oxygen. By precipitation from some of its saline combinations, a yellow oxyd has been obtained, in which the proportion of oxygen amounts to ten *per cent.* The oxyd in both instances may be decomposed, and the oxygen completely expelled, by an elevation of temperature not much superior to that of ignition.

The attraction of gold to oxygen is so weak, that it is scarcely affected by the greater number of acids. It was formerly supposed to be perfectly insoluble in the nitrous and nitric acids, which in general part with oxygen with so much facility, and when gold leaf is put into the acid cold, it seems to suffer no change, but when nitric or nitrous acid is boiled on gold, it is capable of dissolving a small portion of it. The quantity dissolved is, however, so inconsiderable, and depends on so many conditions, which it is needless to enumerate, that the accuracy of the processes of assaying can scarcely be affected by it.

When gold is dissolved in the nitro-muriatic acid, or in a mixture of equal parts of nitric and muriatic acids, an effervescence takes place, and the solution becomes of a yellow colour. In this process the nitric acid is decomposed, its oxygen combines with the gold, and the oxyd, as it is formed, is dissolved in the muriatic acid. By adding lime-water a precipitate is formed, which is the yellow oxyd of gold, consisting of from eight to ten parts of oxygen in the hundred. There is no action between gold and azote, hydrogen, carbon, or sulphur: but the oxyds of gold are readily decomposed by hydrogen, as will be soon seen.

Phosphorus combines with gold by heating together in a crucible a mixture of one part of gold in filings, with two parts of phosphoric glass, and an eighth part of charcoal. Great part of the phosphorus is separated from the acid, and driven off, but there remains a small quantity united with the gold, forming a phosphuret of gold. It may be done also by adding phosphorus to gold in a red heat in a crucible. It is, in this state, pale coloured, granulated, brittle, and a little more fusible. The proportion of phosphorus is not more than one part in twenty-four; and the substance may be decomposed by being kept in fusion; the phosphorus is driven off in the state of vapour, and inflamed. Bergman has arranged the affinities of gold and its oxyds in the following order:

<i>Gold.</i>	<i>Oxyds of Gold.</i>
Mercury,	Muriatic-acid,
Copper,	Nitric,
Silver,	Sulphuric,
Lead,	Arsenic,
Bismuth,	Fluoric,
Tin,	Tartaric,
Antimony,	Phosphoric,
Iron,	Prussic.
Platine,	
Zinc,	
Nickel,	
Arsenic,	
Cobalt,	
Manganese.	

*Salts of Gold.*—These are the nitrate and muriate.

1. *Nitrate of Gold.* When concentrated nitric acid is several times successively poured upon gold, boiled and distilled to dryness, the gold is dissolved, and the solution assumes a yellowish colour. This solution is more readily effected in proportion to the quantity of gas or nitrous gas which the acid contains. Gold-leaf, according to Fourcroy, is dissolved in

nitric acid, impregnated with nitrous oxyd, and he supposes that it is owing to the nitrous oxyd that the gold is oxydated, this oxyd being so much more easily decomposed than the nitric acid. The acid which, at first, is deprived of its colour by the oxydation of the gold, as this oxyd is dissolved, assumes an orange-yellow colour, holding in solution the nitrate of gold with an excess of acid. The nitrate cannot be obtained in crystals, and it is decomposed by heat or by being exposed to the light of the sun; it is also decomposed by the alkalis, or by introducing a plate of tin or silver into the solution, and the purple oxyd is precipitated in the form of powder; and likewise by muriatic acid, which at the instant of combination converts the orange-colour to a pure yellow.

2. *Muriate of Gold.*—Muriatic acid of itself has no action on gold, or on its purple oxyd, but gold is immediately oxydated and then dissolved in oxymuriatic acid: or if nitric acid be added to the mixture in certain proportions, the solution of gold in the mixture is readily effected: hence the nitro-muriatic acid was distinguished by the name of “aqua regia,” because it dissolved gold, which was regarded by the alchemists as the king of metals. The nature of the chemical action is thus explained. Gold is oxydated with great difficulty, but it is effected by oxymuriatic acid, which readily parts with its oxygen, or by the addition of the nitrous to the muriatic, the former of which is decomposed, giving out its oxygen to the gold, which being now oxydated is dissolved in the muriatic acid, forming with it a muriate of gold. This solution of the muriate of gold is of a deep yellow colour, extremely acrid and caustic; has an astringent metallic taste, and stains the skin of a deep purple colour, which becomes darker by exposure to the air and light. It produces a similar effect on all vegetable and animal matters, and on marble and siliceous stones. By evaporating the solution to one half, nitric acid is disengaged, and crystals are obtained. These assume a red colour by the action of strong light. They attract moisture from the air, and spontaneously become liquid. When oxymuriatic acid is used, the oxygen of this acid being retained even by a weaker affinity than the nitric acid, the gold attracts it, and combines with the muriatic acid. In this case the solution is slow, and but a very small quantity of gold can be dissolved, partly from the oxymuriatic acid not being in a very concentrated state, and partly, it is supposed, from the quantity of oxygen present not being such as to form a sufficient quantity of oxyd to saturate the acid. It ought, however, to be observed, that if the late discoveries of professor Davy be established, which make the oxy-muriatic acid a simple substance, and even possessing no oxygen whatever, then a new theory must be introduced to account for the facts above-stated. In oxy-muriatic gas, gold-leaf is instantly fused with inflammation, and dissolved.

Gold cannot be dissolved by the other acids when in its metallic state, but its oxyds may be combined with them, and a number of the salts of gold be formed. The sulphate and nitrate also, as we have seen, do not crystallize: the phosphate of gold may be fused, and in this state it forms a fine red glass. We shall now briefly notice some of the properties of the muriate of gold. In connection with this subject, we must not omit the experiments of Mrs. Fulham, which she announced in an “Essay on Combustion,” with a view to a new art of dyeing and painting, &c. in the year 1794, and which were, at that period, expected to lead to some important practical results.

The muriate of gold is very soluble in water, and is decomposed in hydrogen gas. If a piece of silk be moistened

with a solution of muriate of gold, the salt is decomposed, and the gold, reduced to the metallic state, attaches itself to the silk. It is decomposed also by phosphorus. If a stick of phosphorus be introduced into a saturated solution of muriate of gold, the salt is decomposed, and the gold, being reduced to the metallic state, forms a cylindrical covering to the phosphorus, which may be separated by dissolving the latter in hot water. A similar effect is produced by burning sulphur, by sulphurated and phosphorated hydrogen gases, and by sulphurous acid. If a solution of muriate of gold be cautiously added to sulphurous acid, a fine pellicle of gold appears on the surface, which is instantly precipitated in the form of small grains. These, and many other experiments equally curious and interesting, were first described by the late above-mentioned, and the rationale of the subject is thus explained. All the substances which have been enumerated have a stronger affinity for oxygen than gold, so that the oxyd of gold, in combination with the acid, is decomposed; the oxygen combining with the hydrogen, and forming water, or with the phosphorus or sulphur, and forming sulphuric or phosphoric acid.

The muriate of gold is soluble in ether, and forms with it a solution of a golden yellow colour, which floats on the top of the fluid. By the addition of ether to a solution of gold, and agitating the mixture, as soon as it is left at rest, the two liquids separate, the ether rises to the top, and assumes a yellow colour, while the nitro-muriatic acid remains below and becomes white. By a process of this kind a tincture of gold was prepared, called "potable gold." The solution of gold in ether is not permanent: it is quickly reduced to the metallic state, and is sometimes found crystallized on the surface. The ethereal solution is used by Mr. Stodart for defending lancets, and other surgical instruments, from injury by a moist atmosphere.

The muriate of gold is decomposed by all the alkalies and earths, and is reduced to the state of yellow oxyd.

Most of the metals decompose the muriate of gold: copper, iron, zinc throw down the gold in its metallic state: other metals, as silver or lead, in the state of purple oxyd. The precipitate obtained by means of tin is valued for the beauty of the colour which it gives to glass or enamel. This preparation is known to artists by the name of the "Purple powder of Cassius," and it may be obtained by various processes. That which is commonly resorted to, is to dissolve pure gold in a nitro-muriatic acid, which is composed of three parts of nitric and one of muriatic acid. A solution of tin is to be prepared by dissolving the metal, in small portions at a time, in an acid containing two parts of nitric and one of muriatic acid, previously diluted with an equal weight of water. This solution, after it is saturated, is largely diluted, perhaps with a hundred parts of distilled water: to this the solution of gold equal in quantity to half the quantity of solution of tin, is added, and the precipitate is obtained after it is allowed to subside, which is to be washed and dried. This is the only known preparation capable of giving a red colour to glass; and if the experiment be performed with accuracy and judgment, the glass so treated serves as a capital imitation of the ruby. The process is, however, attended with considerable difficulty, owing to the colour of the precipitate being various, from circumstances not easily discovered. According to Pelletier, it is a compound of oxyds of tin and gold; and its formation is owing to the strong attraction of the tin for the oxygen, with which it is disposed to combine in large quantities. When the solutions, above described, are mixed, the oxyd of tin, which is nearly at the minimum of oxydization, at-

tracts part of the oxygen of the oxyd of gold: the two oxyds thus brought to states of oxydization, different from those in which they existed in the separate solutions, and probably likewise exerting mutual affinities, are no longer soluble, and are precipitated in combination. Muriate of gold is decomposed by some other metallic salts, in consequence of similar actions; the oxygen of the oxyd of gold being attracted by the oxyd of the other metal, which hence passes to a higher state of oxydization. Those which have a strong tendency to exist in such a state, are capable even of completely de-oxydizing the oxyd of gold. Example.—If a solution of the green sulphate of iron be added to the solution of muriate of gold, the gold is precipitated in very minute particles in the metallic state, while the iron passes to the state of a red sulphate. A solution of muriate of gold, when concentrated by evaporation, yields beautiful yellow crystals, not unlike topazes.

Gold, as we have seen, does not combine with sulphur by fusion, and on this is founded a method of freeing it from silver or other metals, the alloy being fused with sulphur, the silver, &c. unite with the sulphur, leaving the gold separate. But gold and sulphur may be united by the medium of an alkali. Example.—Let a sulphuret of potash be fused with one-eighth of its weight of gold-leaf, and the combination is even soluble in water, the solution being of a green colour.

*Alloys of Gold.*—Gold forms alloys with the greater number of the metals, which produce on the metal so alloyed a very particular change in its properties. An extensive and accurate series of experiments on these alloys was made by Mr. Hatchet, with the view of determining some important and interesting facts relating to the use of gold as a coin. Of these we shall give a brief abstract, referring our readers for a more particular account to the Transactions of the Royal Society for the year 1803.

The chief enquiry of Mr. Hatchet, as connected with the alloys of gold, was, whether soft and ductile gold, or gold made as hard as is compatible with the process of coining, suffers most by wear. His experiments were intended to examine the effects which various metals produce upon gold, when combined with it in given proportions, beginning with  $\frac{1}{12}$ th, which is the standard proportion of alloy, and gradually decreasing to  $\frac{1}{100}$ th part of mass. The results drawn from the trials were, that fine gold, alloyed with silver, with copper, and with tin, did not suffer any loss during the experiment. The gold alloyed with lead only lost three grains, chiefly by vitrification; with iron it lost 12 grains, which formed scoria; with bismuth it lost 12 grains, chiefly by vitrification; with zinc it lost a pennyweight by volatilization; and with arsenic, it not only lost the whole quantity of alloy, but also two grains of the gold which were carried off in consequence of the rapid volatilization of the arsenic. Hence it was inferred that only two metals are proper for the alloy of gold coin, namely, silver and copper; as all the others either considerably alter the colour, or diminish the ductility of gold. In respect to the latter quality, the different alloys employed in this series of experiments appear to affect gold nearly in the following decreasing order: 1. Bismuth. 2. Lead. 3. Antimony. 4. Arsenic. 5. Zinc. 6. Cobalt. 7. Manganese. 8. Nickel. 9. Tin. 10. Iron. 11. Platina. 12. Copper, and, 13. Silver. The three first have nearly the same effect on gold, and bismuth is found to render gold brittle when the proportion of that metal is to gold only as 1 to 1920; even the vapour arising from bismuth, lead, and antimony in fusion, produces these changes.

The alloy with platina is of a yellowish white colour, very ductile, and of a considerable specific gravity. The alloy with silver in the standard proportion, or 1 to 12, approaches, as we have seen above, the nearest to the ductility of fine gold of any alloy, and its specific gravity differs but little from the mean specific gravity of the two metals. When the silver amounts to  $\frac{1}{4}$ th, the colour of the alloy approaches to green, and forms the green gold of the goldsmiths. In combination with copper, gold has its colour rather heightened than impaired; its hardness is increased and its ductility very little lessened, when the standard proportion of 1 part in 12 is not exceeded. This alloy of 22 carats fine is generally used, when gold is fabricated into plate or ornaments, and likewise forms the gold coin of the country. With quicksilver, gold unites with great facility, making with it an amalgam which will be described hereafter. The alloy with iron is much harder than gold, very ductile and malleable; but the colour is debased to a dullish grey, inclining to white. Tin was formerly regarded as the metal which rendered the alloy with gold the most brittle of all the alloys, but the experiments of Mr. Bingley and Mr. Hatchet have shewn that this notion is to a certain extent erroneous, and that the effects produced by the mixture of tin with gold, ought probably to be ascribed to other metals, with which the tin was contaminated, such as bismuth, antimony, lead, and zinc. The alloy, consisting of equal parts of zinc and gold, is very hard and susceptible of a fine polish, and not being subject to much alteration from the air, it is recommended for the fabrication of the mirrors of telescopes. The alloy of gold with silver, in which there is only  $\frac{1}{2}$ th part of silver, changes the colour of the gold very sensibly; and the alloy is employed for foldering gold, being more fusible than this metal.

**GOLD, Physical properties of.** *Gold, aurum*, a yellow metal, heavy, pure, ductile, malleable, and shining; and on those accounts, the most valuable of all metals. In fusibility it ranks between silver and copper; it is not oxydable by fusion in atmospheric air; nor is it acted upon by any of the acids, except the oxy muriatic and nitro-muriatic.

The yellow colour of gold is rendered paler by fusion with borax; but this may be prevented or corrected by fusion with nitre, or sal ammoniac. The colour of gold is heightened by an alloy of copper, and this property of copper has given rise to sundry processes for exalting the colour of this noble metal. Other metals render it paler. The alchemists call gold, *sol*, the sun; to denote its pre-eminence over the other metals, which are called by the names of the planets. Its symbol, or character, is O; which, in their hieroglyphical way of writing, denotes perfection, simplicity, solidity, &c.

The weight of gold is to that of water, according to some statements, as 19.637 to 1000. Fine gold, immersed in water, weighs nearly one nineteenth part less than in air, and consequently it is upwards of nineteen times heavier than its own volume of water. However, the specific gravity of gold, or its comparative weight with an equal volume of water, has been variously assigned: some have made it 19.637, others 19.640, and in the Swedish Transactions it is made no less than 20.000; that of water being 1000. Others again have made it as low as 18.75. But from the experiments of Mr. Ellicot, it does not appear to have exceeded 19.207; and from those of Dr. Lewis, on the purest gold, well hammered, its gravity is stated between 19.300 and 19.400. In all experiments of this kind, the result should be specified with an account of the sensibility of the balance, and the quality and warmth of the water. An increase of heat rarefying water more than it does gold, the

gold must turn out proportionably heavier than its own volume of the expanded fluid; and this difference is not considerable than it has generally been supposed. In passing from freezing to boiling water, or by an augmentation of heat equivalent to 180° of Fahrenheit's thermometer, Dr. Lewis found that a rod of gold was lengthened about one part in 700, and consequently its volume increased about one part in 233, while the volume of water is increased about one sixth or more; hence it appears, that by an augmentation of 40° of the thermometer, or from a little above 200° to the former heat, the volume of gold, if its expansion is uniform, is increased one part in 148, and that of water one in 117; and the gravity of gold, weighed in the water before warmed and expanded, should be greater than when the gold and water are 40° colder, in the proportion of 10,400 to 19,265 to 19,400; and this calculation gives a difference in the gravity, of 0.034 for every 10° of the thermometer; but some trials seemed to make it greater. It has been imagined, that the comparative gravity of gold to bulk weights, which are more than double in volume to an equal weight of gold, must be so far influenced by the variable gravity of the atmosphere, that there might be an advantage in buying gold by weight when the air is lightest. But Dr. Lewis observes, that this difference appears too inconsiderable to be regarded in a commercial view. For the loss of weight of the two metals in the air being as much less than their loss in water, as air is lighter than water; and as, if we admit the accuracy of the conclusion deduced from an experiment of Mr. Hawkbee, being in its lightest state about a 937th, and in its heaviest state about an 849th part of the weight of water; it will be found, on calculation, that the gold preponderates above the loss, in the heaviest more than in the lightest air, only by one part in 155,000, or one grain in about 302 ounces; which is a difference too minute to be sensible in the nicest balance. If the mean gravity of gold be reckoned 19,300, as a cubic inch of water weighs about 254 grains, a cubic inch of gold will consequently weigh about 4902 grains, or 10 ounce, 102 grains. The pound weight, or twelve ounces Troy, of gold, is divided into twenty-four carats. Dr. Lewis states the specific gravity of fine gold at 53° Fahrenheit, to be 19.376. According to Brisson the specific gravity of fine gold in ingot is 19.258, and when hammered 19.271. The specific gravity of gold made standard by mixing copper, was found by Mr. Hatchet (see Phil. Trans. 1783) to be 17.281, when cast in an iron mould; but when the same was cast in sand, it was only 16.994. (*See Specific Gravity.*) The softness of gold, for it is nearly as soft as tin, and its toughness, adapt it for receiving the impressions of dies, and of course to be reduced to the state of coin, and for various other purposes in the arts. It is but slightly elastic and sonorous. With regard to tenacity, it is inferior to iron, copper, platina, and silver, and therefore the assertions of former chemists and philosophers have been contradicted by later experiments. The gold has been usually represented as the most tenacious as well as the most ductile of all metals. Its malleability and ductility are sufficiently evinced by the *Gorn-lyf* and *Gorn-rod*, which see. See also DUCTILITY.

The value of gold to that of silver, was anciently only as twelve to one. Indeed, this proportion varies as gold is more or less plentiful: for Strabo relates, that Cæsar brought such a quantity of gold from Italy, that the pound of gold was only worth seven pounds and a half of silver. In our coinage, the value of fine gold to fine silver is nearly as 15 to 1. (See COIN and STANDARD.) Sir Isaac Newton observes, in a representation to the lords of the treasury

in the year 1717, that in the mints of Spain and Portugal the value of gold is sixteen times that of silver; but that in those countries, payments in silver bearing generally a premium of six per cent. the proportion may be considered as fixed by commerce at 15.5 to 1; that in the other parts of Europe, the value of gold is at most fifteen, and in China and Japan but nine or ten times that of silver; so that gold is rated higher in England than in any other part of Europe, and higher in Europe than in the Eastern countries. Hence, in great measure, arise the profits of exchanging gold for silver in one place, and re-exchanging them in another; and hence the greater disparity between the relative quantities of gold and silver in one commercial nation than in another; this metal being brought in most abundance which is rated highest in proportion to the other, and that which is rated lowest being drained away. There are various ways of determining the fineness of gold; or the proportion of alloy which it contains. Those who are used to this business can judge nearly the proportion of alloy from the colour of any given mass, provided that the species of alloy be known. For the method of doing this, see *Toucan-needles*. The great excess of the weight of gold, above that of the metals used for its alloy, affords another method of determining the quantity of alloy in any given mass, where the species of alloy is known. Thus fine gold loses in water one grain in every 19.3 nearly; and fine silver loses one grain in about eleven; from whence it is easy to find the loss of any number of grains of each, and consequently of any assignable mixture of the two metals. Thus, fifty grains of gold will lose above 2½, and fifty grains of silver somewhat more than 4½; so that a mixture of equal parts of the two will lose above seven in a hundred, or one in fourteen. A mixture of gold with half its weight of silver will lose one part in 15.4; with a third of silver, one in 16.2; with a fourth, one in 1.67; and with an eleventh of silver, which is the standard proportion of alloy, one in 18 1. On this principle, the specific gravity or proportional loss in water, of gold alloyed with different quantities of silver, copper, and mixtures of both, may be computed and formed into tables for use. The accuracy of this method, it should be observed, depends on the supposition that each of the two metals, that are melted together, retains its own proper gravity, which is the case in mixtures of gold and silver; but gold and copper, melted together, are specifically lighter than if they were weighed separately; or the specific gravity of the alloy is less than that of the mean of its ingredients; the case is the same with the alloys of nickel and gold, of lead and gold, of iron and gold; but the reverse happens in mixtures of gold with zinc, bismuth, and tin. It appears, therefore, that the hydrostatic balance cannot discover, with certainty, the exact fineness of gold, unless when silver is the metal mixed with it.

There are various methods of separating gold from gilt works: it may be separated from the surface of silver, either by spreading over the gilt silver a paste made of powdered sal ammoniac moistened with aquafortis, and heating it till the matter smokes, and is nearly dry; throw it into water, and the gold will easily come off by rubbing it with a scratch brush: or, by putting the gilt silver into common aqua regia, nearly boiling, and turning the metal frequently, till it becomes all over black; then wash it with water, and rub it with the scratch brush, which will disengage the gold left by the aqua regia. See *GILDING*.

Gold may be separated from gilt copper, by applying a solution of borax to the gilt parts with a pencil, and sprinkling over the place thus moistened a little powdered sulphur; when the piece is made red-hot and quenched in water, the gold may be wiped off with a brush.

Gold may be recovered from wood, gilt on a water size, by steeping it for a quarter of an hour in a quantity of very hot water, sufficient to cover it; then scrub the wood in a little warm water, with short stiff brittle brushes of different sizes: boil the whole mixture of water, size, gold, &c. to dryness; make the dry matter red-hot in a crucible to burn off the size, and grind the remainder with mercury. The gold will be more easily laid hold of by the mercury, by the addition of some clean sand.

*GOLD, Alchemical History of.* See *PHILOSOPHER'S Stone*, and *TRANSMUTATION*.

*GOLD, Amalgam of,* is a preparation of gold much used by the gilders (see *GILDING*); and it is made by heating some pure quicksilver in a clean crucible, and adding to it, when it is nearly boiling, about a sixth of its weight of fine gold in thin plates that are hot; after this mixture has been kept hot for a few minutes, it becomes an homogeneous substance; and when cold, it is put into a piece of soft leather, and which is gradually pressed till the fluid part of the amalgam, consisting almost wholly of mercury, is forced through the pores of the leather; while the gold, combined with about twice its weight of mercury, will remain in the state of a yellow silvery mass, of the consistence of soft butter; when this mass has been bruised in a mortar, or shaken in a phial, with repeated portions of salt and water, till the water receives no foulness from it, it is fit for use, and may be preserved for any time in a corked phial. For the purposes of gilding it is of great importance, that this amalgam should be formed of pure materials, as any portion of lead or bismuth would deteriorate the colour of the gold, and tarnish it with black specks. The mercury should therefore be previously distilled from the red precipitate (nitrous red oxyd of mercury), either alone or mixed with a little charcoal powder. See *AMALGAM* and *MERCURY*.

*GOLD-beating,* and *GOLD-beater's skin.* See *GOLD-leaf*.

*GOLD, Burnished,* is that which is polished with a steel instrument, called a burnisher, if it be wrought gold, or gilding on metal; or with a wolf's tooth, if it be gilding in water. See *GILDING*.

*GOLD Chain.* See *CHAIN*.

*GOLD Coin,* or *species of gold.* See *COIN* and *COINAGE*.

*GOLD Colour on Glass and China.* See *GEMS, GLASS, GILDING,* and *PORCELAIN*.

*GOLD-coloured Glazing.* See *GLAZING*.

*GOLD-coloured Metal* is produced by melting zinc with copper. According to the purity of the zinc and copper, the proportions in which they are mixed, and the intimacy of their union, the compound metal proves more or less malleable, and approaches more or less to the colour of gold. Some direct the zinc to be taken only in a fifth or sixth part of the weight of the copper, and others in an equal weight or more. Dr. Lewis observes, from the result of many experiments, that both with the smallest and largest of these quantities of zinc, the metal proves more like gold than with the intermediate proportions.

The colour of these compounds is improved by a small mixture of some other metallic bodies. Cramer recommends the addition of a small quantity of pure tin to copper, melted with a fourth or sixth part of zinc, which forms a compound metal, that acquires, on being well cleaned, and laid in the air for some days, a superficial colour of fine gold. Geoffroy says that iron has the best effect: with the proportions of ten parts of zinc, eight of copper, and one of iron-filings, he produced a metal of a fine smooth grain, compact, hard, and bright, and of a beautiful gold colour. By making the copper first into brass, and then melting it with a suitable quantity of zinc, a metal may be obtained of se-



superior quality to that produced either by melting the copper and zinc, or by impregnating the copper with zinc, by cementation and fusion with calamine; which is a method sometimes practised. A very ingenious artist, says Dr. Lewis, who now prepares a gold-coloured metal in great perfection, has a fine kind of brass made on purpose for this use. The union of the copper and zinc in fusion, succeeds best and with least loss of the zinc, according to Dr. Lewis, by using a mixture of black flux and borax, or a composition of twelve parts of green glass powdered, six parts of potash, two of borax, and one of powdered charcoal: when this flux is fused in the crucible, the copper and zinc are dropped into it; and when they appear perfectly melted, they are to be well stirred together with an iron rod, and expeditiously poured out. The same flux will serve for melting several fresh quantities of the metal. Dr. Hooke gives the following receipt for making a gold-coloured metal: eight parts of distilled verdigris, *i. e.* of verdigris purified by solution in distilled vinegar and crystallization, and four parts of Alexandrian tutty, with two of nitre, and one of borax, are directed to be mixed with oil to the consistence of pap; then melted in a crucible, and poured into a flat mould first well warmed. A composition of this kind is called *aurum sophillicum*.

The following method is recommended by Homberg for giving a gold colour to copper, without the addition of zinc; make an amalgam of one part pure copper, and three parts quicksilver; boil this in river-water for two hours, then distil off the quicksilver in a retort, and cohobate it once; take out the copper and fuse it, and it will be found of a beautiful gold colour, more ductile than common copper, and extremely well fitted for watch-work, gilding, and the finer machines and utensils. The celebrated Mr. Pott affirms that a gold-coloured metal may be made from a mixture of copper and tin, and directs it to be compounded in the following manner: Take one half ounce of tin ashes, and four half ounces of copper; melt them well together in a close luted crucible, with a strong fire; or take one half ounce of the purest tin cut in pieces, and sixteen half ounces of pure copper beaten into thin plates; lay the tin between the copper-plates, lute the crucible close, and melt with a strong fire. See *Prince's METAL* and *TOMBAC*.

Silver is tarnished superficially, by certain vapours, as that of putrid urine, to a colour so like that of gold, that several edicts have been issued in France to prevent frauds of this kind with regard to wire and laces.

*GOLD-coloured Pigments.* See *PIGMENTS*.

*GOLD-coloured Varnish.* See *LACQUER*.

*GOLD, Crown.* See *COIN* and *STANDARD*.

*GOLD, Dutch,* is a kind of leaf used in gilding, &c. which is copper gilt, or brass beaten into leaves like the genuine gold-leaf. It is said to be made from copper-plates, by cementation with calamine, without subsequent fusion. The thickness, compared with that of leaf-gold, is as nineteen to four, and under equal surfaces it is considerably more than twice as heavy as the gold.

*GOLD, Farthing of.* See *FARTHING*.

*GOLD, Fine or Pure,* is that purged by the fire of all its impurities, and all alloy. The Latins call it *aurum purum*, *aurum primum*, *aurum obrizum*, *aurum coctum*.

The moderns frequently call it *gold of twenty-four carats*; but, in reality, there is no such thing as gold so very pure; and there is always wanting at least a quarter of a carat. Gold of twenty-two carats has one part of silver, and another of copper: that of twenty-three carats has half a part, *i. e.* half a twenty-fourth of each.

Boneterouze maintains, that the electrum of the ancients

was gold of nineteen carats; or four parts gold, and a fifth silver.

From an ordinance of king John of France, it appears that the gold then struck at Paris was of finest carats one-fifth; and that it is added that it was the best and finest gold then known on earth. See *STANDARD*.

*GOLD, Fulminating, aurum fulgurans,* a product of gold from its nitro-muriatic solution by ammonia, which possesses a most remarkable explosive property. See *AMMONIA*.

It is prepared by diluting a solution of married gold with six or eight times its bulk of distilled water, adding drop by drop liquid ammonia, till the precipitate ceases; then let the yellow powder thus obtained be separated by a filter, well washed in hot water, and afterwards dried. The fulminating gold, thus prepared, will exceed the weight of the original gold by about 33 parts in 100. If a small quantity, *e. g.* half a grain, of this powder be held over a candle, in a spoon or on the blade of a knife, it presently explodes with a very loud report. This powder should be very cautiously used; the temperature requisite for its explosion is stated at above 250° of Fahrenheit. Before it explodes, its yellow colour changes to black, and at the moment of its decomposition an instantaneous flash is observed. The principal energy in explosion is directed downwards, inasmuch that two or three grains of it exploded on a moderately thick sheet of copper will burst a hole in it. This salt is decomposed by an electrical shock, but it cannot be ignited by a spark from electricity or from flint and steel. It will vehemently explode by sudden friction, and therefore, in order to avoid dangerous accidents of this kind, it should never be kept in a ground-topped bottle. The facility of its explosion is very much increased by high drying; so that if it be heated till it becomes black, and is immediately removed from the fire, it will frequently go off by a mere touch. If the fulminating gold be mixed with four or five times its weight of chalk, or sulphat of potash, or with any pulverulent substance neither fusible nor decomposable at a moderate temperature, and exposed gradually to a low heat, it will be quickly decomposed, leaving merely the purple oxyd of gold. The same effect may be produced by very cautiously heating the fulminating gold without any addition, removing it from the fire when it has changed its colour, and when cold heating it again, and proceeding in this way till the powder becomes purple, in which state it will have entirely lost its explosive faculty. A similar change occurs by melting sulphur at the lowest possible heat, and dropping in the fulminating gold by half a grain at a time, well mixing it; the sulphur may then be burnt off without danger, and minute grains of metallic gold will be left behind. "The true theory of the decomposition of fulminating gold was partially discovered by Bergman, and has since been fully illustrated by Berthollet. The former of these able chemists shewed that this salt when decomposed in close vessels was reduced to gold, partly in the metallic state and partly in that of purple oxyd, and at the same time a gas was extricated in bulk about a thousand times as great as that of the original fulminating salt, and which extinguished flame and animal life, was not absorbed by water, and gave no precipitate with lime-water. Berthollet, by decomposing the same substance in a copper tube, connected with a jar inverted in mercury, obtained azotic gas and a few drops of water, and the gold was reduced to the metallic appearance. Now as ammonia is composed of hydrogen and azotic, and as the affinity of gold for oxygen is very slight, it is manifest that the decomposition and explosion, under the circumstances already mentioned, are occasioned by the oxygen of the

gold and the hydrogen of the ammonia combining to form water, and to the liberation of the azot and its sudden assumption of the gaseous state." Aikin's Dict.

**GOLD, Leaf, or beaten gold,** is gold beaten with a hammer into exceedingly thin leaves. It is astonishing to consider the fineness to which a body of gold is thus reduced. In an experiment of Reaumur's, forty-two square inches and three tenths of gold-leaf weighed one grain Troy; and Mr. Boyle found that fifty and seven tenths weighed but a grain. As a cubic inch of gold weighs 4902 grains, the thickness of the gold-leaf examined by the one was the 207355th, and of that by the other only the 248532nd part of an inch. See *DUCTILITY of Gold*.

This gold is beat on a smooth block of black marble, from two hundred to six hundred pounds in weight, and about nine inches square on the upper surface, fitted into the middle of a wooden frame, about two feet square, so as that the surface of the marble and frame form one even plane. Three of the sides are furnished with a high ledge, and the front, which is open, has a leather flap fastened to it, which the gold beater uses as an apron, for preserving the fragments of gold that fall off. Three hammers are employed in this business, having two round and somewhat convex faces: the first, called theutch hammer, is about four inches in diameter, and weighs fifteen or sixteen pounds: the second, called the shoddering hammer, weighs about twelve pounds, and is about the same diameter: the third, called the gold or finishing hammer, weighs ten or eleven pounds, and is nearly of the same width. The French use four hammers, differing both in size and shape from those of our workmen.

The gold beaters also use three kinds of animal membranes; some of which are laid between the leaves to prevent their uniting together, and others over them to defend them from injury by the action of the hammer. For the outside cover, they use common parchment made of sheep skin; for interlaying with the gold, first, the smoothest and closest vellum made of calves skin; and afterwards, the much finer skins of ox-gut, stript off from the large straight gut slit open, prepared on purpose for this use, and hence called *gold-beater's skin*. The general process of their preparation, is said to consist in applying one upon another, by the smooth sides, in a moist state, in which they readily cohere and unite inseparably, stretching them on a frame, and carefully scraping off the fat and rough matter, so as to leave only the fine exterior membrane of the gut; beating them between double leaves of paper, to force out the remaining unctuousity; moidening them once or twice with an infusion of warm spices, and lastly, drying and pressing them. It is said, that some calcined gypsum, or plaster of Paris, is rubbed with a hare's foot, both on the vellum, and ox-gut skins, which fill up their pores, and prevent the gold leaf from sticking. These skins, after seventy or eighty repetitions, become unfit for use; but their virtue may be restored by interlaying them with leaves of paper moistened with vinegar or white wine, beating them for a whole day, and afterwards rubbing them over with plaster of Paris; and even holes in them may be repaired by the dectuous application of fresh skins.

**GOLD, the manner of preparing and beating.** They first melt a quantity of the purest gold in a black-lead crucible, with some borax, in a wind furnace, and pour it into an iron ingot mould, six or eight inches long, and  $\frac{3}{4}$  of an inch wide, previously greased and heated; the bar of gold is made red-hot and forged on an anvil into a long plate, which is farther extended, by being passed repeatedly between polished steel rollers, till it becomes a ribband, as

thin as paper. This ribband is divided by compasses, and cut with shears into equal pieces, which are forged on an anvil till they are an inch square, and afterwards well annealed. Two ounces of gold, which is the quantity melted at a time, make a hundred and fifty of these squares, so that each of them weighs six grains and two fifths; and as 4902 grains of gold make a cubic inch, the thickness of the square pieces is about the 766th part of an inch. All these squares are interlaid with leaves of vellum, three or four inches square; one leaf being laid between every two of them, and about twenty more of the leaves are laid on the outides: over these is drawn a parchment case open at both ends, and over this another, in a contrary direction, so that the vellum and gold leaves are kept tight and close. The whole is then beaten with the heaviest hammer, till the gold is stretched to the extent of the vellum: the pieces taken out of this case or mould, are cut in four with a steel knife; and the six hundred pieces thus produced are interlaid, in the same manner, with pieces of the ox-gut skins, five inches square. The beating is repeated with a lighter hammer, till the golden plates have acquired the extent of the skin; when they are divided into four, by a piece of cane cut to an edge. The whole number of leaves is then divided into four parcels, which are interlaid, as before, and beaten separately, till they are stretched for the third time to the size of the skins. The French repeat the division and beating once more. After the last beating, the leaves are taken up by the end of a cane instrument, and being thrown flat on a leather cushion, are cut to a size, one by one, with a square frame of cane made of a proper sharpness, or with a frame of wood edged with cane. They are then fitted into books of twenty-five leaves each, the paper of which is well smoothed, and rubbed with red bole to prevent their sticking to it. The size of the French gold leaves is from somewhat less than three inches to  $3\frac{1}{4}$  square; that of our's from three inches to  $3\frac{1}{2}$ . We shall here observe, that the gold used for the above purpose is never pure, because pure gold is too ductile to be worked between the gold-beater's skins. The newest skins will work the finest gold, and make the thinnest leaf, because they are the smoothest. Old skins, being rough or foul, require coarser gold. The finest gold for this purpose has three grains of alloy in the ounce, and the coarsest 12 grains. In general the alloy is six grains, or one eightieth part. The alloy of leaf-gold is silver, or copper, or both, and the colour is produced of various tints accordingly. Two ounces and two pennyweights of gold are delivered by the master to the workman, who, if very skillful, returns 2000 leaves, or 80 books, of gold, together with one ounce and six pennyweights of waste cuttings. Hence one book weighs 4.8 grains; and as the leaves measure 3.3 inches in the side, the thickness of the leaf is one two hundred and eighty-two thousandth part of an inch.

The French prepare what is called green gold-leaf, from a composition of one part of copper and two of silver, with eighty of gold; but Dr. Lewis observes, that such an admixture gives no greenness to gold, and that this kind of leaf is made from the same fine gold as the highest gold-coloured sort, the greenish hue being a superficial taint given to the gold in some part of the process: this leaf is chiefly used for the gilding of books. A kind of leaf, called *party-gold*, is formed by laying a thick leaf of silver, and a thinner one of gold, flat on one another; they are then heated and pressed together, so as to unite and cohere; and being beaten into fine leaves, as in the foregoing process, the gold, though only in quantity a fourth

## G O L D.

of that of the silver, extends over it and covers where covers it.

**GOLD, Million of**, a phrase often used to signify a million of crowns.

**GOLD Money.** See MONEY and COIN.

**GOLD, Mosaic**, is gold applied in pannels on proper ground, distributed into squares, lozenges, and other compartments; part of which is shadowed to raise or heighten the rest. See MOSAIC.

**GOLD Plates for Jewelling** see generally made of ducaat gold, whose fineness is from  $23\frac{1}{2}$  to  $23\frac{3}{4}$  carats; and the finest gold is the best for this purpose, unless where some parts of the gold are left bare and unpolished, as in watch-cases, snuff-boxes. See for which purpose a mixture of alloy is necessary, and silver is preferred to copper, because the latter disposes the plates to tarnish, and turn green. See ENAMELLING.

**GOLD, Potable, aurum potabile.** See ATRUM Potabile, and GOLD.

**GOLD Powder**, for the purposes of gilding, may be made by grinding gold leaf with honey, or thick gum-water, (see SHELL-GOLD); by distilling to dryness a solution of gold in aqua regia; by evaporating the mercury from an amalgam of gold, taking care well to stir the mass near the end of the process with a glass rod or tobacco pipe; or by precipitating gold from its solution in aqua regia by applying to it a solution of common green vitriol in water, or some copper, &c.

**GOLD Precipitate with Tin**, called also, from its supposed discoverer, *calx Cassii*, is prepared with great care both in dissolving the tin, and diluting the solution. For this purpose, a mixture of two parts of aquafortis, and one of spirit of salt, is supposed to be the best menstruum for the tin. Into this mixture some fine black tin, granulated, is to be let fall, grain by grain, waiting till one grain is dissolved before another is dropped in, that the dissolution may go on slowly, without any heat or discharge of fumes. The gold is dissolved in common aqua regia; and a few drops of this solution being mixed with some ounces of pure water, as many drops of the solution of tin are added. If the mixture changes immediately to a clear bright purplish red colour, the due degree of dilution has been determined; if the colour appears dull, a greater quantity of water must be added for the rest of the solutions. After the mixture has deposited its red matter, and become clear, a little more of the tin solution is to be dropped in, for discovering and precipitating any gold that may still remain in it; the liquor being then poured off, the precipitate is washed and dried. Lewis's Com. Phil. Techn. p. 176. See Ruby GLASS.

**GOLD, Queen.** See QUEEN gold.

**GOLD, Shell**, is that used by the gilders and illuminers, and with which gold letters are written. It is made by grinding gold leaves, or gold beater's fragments, with a little honey, and afterwards separating the honey from the powdered gold by means of water. When the honey is washed away, the gold may be put on paper, or kept in the shells; whence its name. When it is used, it is diluted with gum-water, or soap-suds. The German gold-powder, prepared from the Dutch gold leaf in the same manner, is generally used, and when it is well scoured with varnish, answers the end in japaner's gilding, as well as the genuine. See GILDING.

**GOLD-size for burnished gilding**, is prepared of one pound and a half of tobacco-pipe clay, half an ounce of red chalk, a quarter of an ounce of black lead, forty drops of sweet oil, and three drams of pure tallow; grind the

clay, chalk, and black lead, separately, and mix them together, add the oil, and mix the mixture to a due consistence; or it may be more properly prepared by grinding together four times the quantity of ochre with the thickest and of best drying oil that can be procured; and, previously to use, mixing red ochre dissolved in turpentine for giving it a proper consistence. See GOLD GILDING.

**GOLD-size of Jewellers** may be made of resin, asphaltum, animi and asphaltum, of each one ounce, and half an ounce of gold, and umbre, of each one ounce, and half an ounce, with a pound of linseed oil, and boiling them, observing to stir them till the whole be incorporated, and appears, on growing cold, of the consistence of tar; strain the mixture through a flannel, and keep it stopp'd up in a bottle, for use. When it is used, it must be ground with as much vermilion as will give it an opaque body, and diluted with oil of turpentine, so that it may be worked freely with the pencil. A simple preparation could be of one pound of linseed oil, and four ounces of gum arabic; powder the gum, and mix it gradually with the boiling oil; let it continue to boil, till it becomes of the consistence of tar; strain it through a coarse cloth, keep and use it as the other.

**GOLD-smith**, or as some choose to express it, *the goldsmith*, the artist who makes vessels, utensils, and ornaments of gold or silver. The goldsmiths work is either performed in the mould, or beat out with the hammer or other engine. All works that have raised figures are cast in moulds, and afterwards polished and finished; plates or discs of silver or gold are beat out from thin flat plates, and tanks and other vessels of that kind are formed of plates soldered together, and their mouldings are beat out with it. The business of the goldsmith formerly required much more labour than it does at present, for they were obliged to hammer the metal from the ingot to the thickness they wanted: but there are now invented stamping-mills, which reduce metal to the thinness that is required, at a very small expence. The goldsmith is to make his own medals, and for that reason ought to be a good designer, and have a taste in sculpture; he also ought to know enough of metallurgy to be able to assay mixed metal, and to mix the alloy.

The goldsmith in London employs several hands under him for the various articles of his trade. In the greatest city there are always hands that excel in every particular branch of the trade, and there is commonly employed one enough for every one in his particular branch. The jeweller, the mail-box and toy-maker, the ivory-turner, the gilder, the turner, the chaser, the roller, and the gold-beater, are all employed by and under the goldsmith.

**GOLD-smith, Company of, in India.** See COMPANY.

**GOLD Thread**, or *spin gold*, is a flattened gilt wire, wrapped or laid over a thread of yellow silk, by turning it with a wheel and iron bobbin. By means of a simple but complex machinery, a number of threads are together twisted at once by the turning of one wheel. The principal art consists in so regulating the motion, that the several circumvolutions of the flattened wire, on each thread, may just touch one another, and form, as it were, one continued covering. At Milan, it is said, they make a sort of flattened wire, gilt only on one side, which is wound upon the thread, so that only the gilt side appears. There is also a gilt copper wire, made in the same manner as the gilt silver, chiefly at Nuremberg; and the ordinaries of France

France require it to be spun on flaxen or hempen threads. The Chinese, instead of flatted gilt wire, use slips of gilt paper, which they interweave in their stuffs, and twist upon silk threads.

**GOLD, Tun of,** is a kind of money of account, formerly used by the Dutch, and in some other countries, containing a hundred thousand florins.

A hundred pounds of, or in, gold, is found to weigh two pounds ten ounces: the sum in silver weighs twenty-six pounds four ounces. Twenty-two pence in copper farthings and half-pence, weigh one pound avoirdupois. A tun of gold, at 4*l.* the ounce, amounts to 96,000*l.* A tun of silver, at 5*s.* 2*d.* the ounce, to 6200*l.* A pound sterling of gold to 48*l.* An ounce is worth 4*l.* The penny-weight 4*s.* One grain, 2*d.* A pound of sterling silver amounts to 3*l.* 2*s.* An ounce is worth 5*s.* 2*d.* The penny-weight, 3*d.* and something more; one grain a half-penny. A pound of silver avoirdupois comes to 3*l.* 5*s.* 3*d.* half-penny.

**GOLD, Virgin,** is pure gold, just as it is taken out of the mines, before it has undergone any action or preparation of fire; whence the Greeks call it *αυρηον*.

Such is the *αυρηον χρυσον*, or gold-dust, and that got by lotion in the lavaderos in Chili: it is added, that there are masses or lumps of pure gold found in the mines, particularly those of Hungary. Accordingly, in the emperor's collection, are still preserved several plates of gold, said to have been thus found.

Virgin gold is sometimes very pale, and so soft, that it may be moulded into any figure with the hand; it even takes an impression from a seal, like the softest wax. To harden it, as also to heighten its colour, they mix emery with it.

**GOLD, White.** See PLATINA.

**GOLD Wire** is a cylindrical ingot of silver, above an inch thick, two feet in length, and weighing about twenty pounds, superficially gilt, or covered with gold at the fire, and afterwards drawn successively through a great number of little round holes of a wire-drawing iron, each less than the other, till it be sometimes no bigger than a hair of the head. There is very little wire made entirely of gold, and this chiefly for one particular purpose, that of billigree work.

It is amazing to what degree of fineness the gold is here drawn; and yet it still keeps firm together, and never shews the least signs of the silver underneath it. The reader may see a computation hereof, as also a more particular account of the manner of proceeding, under the article DUCTILITY of gold.

**GOLD Wire flatted,** is the former wire flatted between two rollers of polished steel, to fit it to be spun in silk, or to be used flat as it is without spinning, in certain stuffs, laces, embroideries, &c.

**Manner of forming Gold Wire and Gold thread, both round and flat**—The first object, which is of the utmost consequence, is the choice of the purest gold; for on this chiefly depends the beauty and durability of the colour of the laces, brocades, and other commodities prepared from it. To a difference in this respect, the boasted superiority of the French laces to the generality of those made in England, till of late, has been wholly owing. With regard to the silver that forms the body of the wire, it is said that there is an advantage in its being alloyed. The French filver for gilding is said to be alloyed with five or six penny-weight, and ours with twelve penny-weight of copper, in the pound Troy. The gold is employed in thick leaves,

which are applied all over the silver rod, and pressed down smooth with a steel burnisher. Several of these leaves are laid over one another, as the gilding is required to be more or less thick. The smallest proportion allowed by act of parliament, is 100 grains of gold to a pound, or 5760 grains of silver. The largest proportion for the best double gilt wire was formerly 120 grains to a pound; but the proportion of gold has been of late increased to about 140 grains. The first part of the drawing process, as well as the preparation and gilding of the silver rod, is performed by the refiner, who uses plates of hardened steel, with a piece of tough iron welded on the back, to prevent the steel from breaking. The holes in these plates are conical, being larger in the back part than in the steel, that the rod may not be scratched against the outer edge, and that they may contain bees-wax, which makes the rod pass more freely, and preserves the gold from being rubbed off. One end of the rod, made smaller than the rest, is pushed through a hole that will admit it, when the plate has been properly secured, and laid hold of by strong pincers, called clamps, adapted to the purpose; to these pincers, which are so contrived, that the force which pulls them horizontally, serves at the same time to press them together, a rope is fastened by one end, and the other end goes round a capstan with cross bars, which requires the strength of several men to turn it. The rod, thus drawn through, is well annealed; it is then passed through the next hole; and the annealing and drawing are repeated, till, being reduced to about the size of a large quill, it is delivered in coils to the wire-drawers. The remainder of the process requires plates of a different quality, which are brought from Lyons in France, and are formed of a metallic mass, whose prevailing ingredient is iron: the holes are drilled in them here. These plates are of two sorts; some of considerable thickness, for the wire in its larger state, and others about half as thick, for the finer wire. In the use of these plates, furnished with a variety of holes, the dexterity of the workman principally consists in adapting the hole to the wire: for this purpose he uses a brass plate, called a *size*, on which is measured, by means of notches, like steps cut at one end, the increase which a certain length of wire should gain in passing through a fresh hole; and if the wire is found to stretch too much or too little, the hole is widened or contracted. Slits of different widths, in thick polished iron rings, serve also as gages for measuring the degree of fineness of the wire.

The wire-drawer's process begins with annealing the large wire received from the refiner, which he does, by placing it, coiled up, on some lighted charcoal, in a cylindrical cavity, called the pit, under a chimney, and throwing more burning charcoal over it. When it is cooled by being quenched in water, one end is passed through the first hole in the thick plate, and fastened to an upright wooden cylinder six or eight inches in diameter; in the top of which are two staples, and through these is passed the long arm of a handle, by which the cylinder is turned on its axis by several men. By this process, called *degrossing*, the wire is frequently annealed and quenched, after passing through every hole, or every other hole, till it is brought to about the size of the small end of a tobacco pipe, and then cut into portions for the fine wire-drawer. In this last part of the wire-drawing process, annealing is not necessary, but the wire is waxed at every hole. The contrivance for drawing the wire through the plate in this case, when less force is needful, is a kind of a wooden wheel placed horizontally, having in its upper surface small holes at different distances from the axis, into one or other of which, according to the force required,

is inserted the end of an upright handle, whose upper end is received in a hole made in a cross bar above. From this the wire is wound off upon a smaller cylinder, called a rochet, placed on the spindle of a spinning-wheel; and this cylinder being placed behind the plate, the wire is again drawn through upon the first, and being brought to the proper fineness, it is annealed for the flattening-mill. In this annealing, the wire is wound on a large hollow copper bobbin, set upright, including small-coal, and encompassed with lighted charcoal or small-coal, communicating a gradual heat. The wire, in this state, must be watched and removed from the heat, when it appears of the proper colour. The next operation is that of the flattening-mill, which consists of two perfectly round and exquisitely polished rollers, formed internally of iron, and wadded over with a plate of refined steel: these rollers are placed with their axes parallel, and their circumferences nearly in contact; they are both turned with one handle; the lowermost is about ten inches in diameter, the upper little more than two, and their width or thickness is about an inch and a quarter. These rolls are sometimes repolished with putty, prepared by calcining a mixture of lead and tin. The wire, unwinding from a bobbin, and passing between the leaves of a book gently pressed, and through a narrow slit in an upright piece of wood, called a ketch, is directed by a small conical hole in a piece of iron, called a guide, to any particular part of the width of the rollers, some of the best of which are capable of receiving, by this contrivance, forty threads. When the wire is flatted between the rollers, it is wound again on a bobbin, which is turned by a wheel, fixed on the axis of one of the rolls, and so proportioned, that the motion of the bobbin just keeps pace with that of the rolls. Dr. Halley states that six feet in length of the finest gilt wire before flattening will counterpoise no more than a grain; and as the gold is not quite  $\frac{1}{57}$ th of the whole, a single grain of gold thus extended will be 345.6 feet long. By flattening, the length of the wire is increased about one-seventh, and its weight is equal to  $\frac{1}{96}$ th of an inch; hence the surface occupied by one grain is equal to 98.7 square inches, with a thickness of  $\frac{1}{490444}$ th of an inch. (See DUCTILITY.) See on the subject of the preceding articles, Macquer's Dict. of Chemistry, Eng. edit 1777. and particularly Dr. Lewis's Philosophical Commerce of Arts, *passim*. See also Aikin's Dictionary.

**GOLD, in Medicine and Chemistry.** The chemists make several preparations of gold for medicinal uses; as salts, mercuries, and tinctures of gold; but it is a point not yet well agreed on, whether gold has any real property whereby it may be of use in medicine.

Some mechanical physicians have had a notion, that if the particles of gold could be rendered fine enough, so as to circulate with the blood, that it would prove more effectual in the cure of diseases than mercury. But this is a mere hypothesis. The *aurum fulminans* has been used, and other preparations of gold are to be met with in authors; but they seem to meet with little credit among modern practitioners.

**GOLD, in Heraldry,** is one of the metals, more usually called by the French name, OR.

**GOLD-finch, in Ornithology,** is the *FRINGILLA carduelis* of Linnæus; which see.

**GOLD-fish, in Ichthyology,** is the *CYPRINUS auratus* of Linnæus; which see.

**GOLD-fish** is also a name by which some authors have called the *aloufa*, *alofa*, or *shid*, from the yellow colouring it frequently has on the covering of the gills. See *CLUPEA Aloufa*.

**GOLD of Pleasure, in Botany** See MYAGRUM.

**GOLD Coast,** or, as it is sometimes called, *Guinea proper*, a country of Guinea, on the S.W. coast of Africa, bordering on that part of the Atlantic which is called the gulf of Guinea, and extending between three and four degrees from the river Ankobar, or, as others say, from the Ceita, or the Assinoo, to the Volta, and deriving its name from the quantity of gold which it produces. It is bounded on the north by Kongo or Congo, on the east by the Slave coast, on the west by the Ivory coast, and on the south by the gulf of Guinea. It comprehends a number of petty states or kingdoms, viz. Adonur, called like-wisè Saku and Avena, Axim, Ankobar, Adom, likewise called Little Inkaflan, or Warsher, Jabi or Jabo, Commodo or Guasso, Fetu, Sabo, Fantin, Acron, Agonna or Angarra, Amra or Aquamboe, Lableade, and Niago or Lambi. Each of these provinces or kingdoms contains one, two, or more towns or villages on the sea-coast, between, or under the European forts and settlements. Eight of these are real monarchies, having their own proper kings; the rest are republics, governed by magistrates, who are subject to the laws and periodical changes. Upon the river Ankobar, or Cobre, which some reckon the first proper county of the Gold Coast, there is a number of towns, which compose three different provinces of Ankobar or Ancober, Aborrel or Abocero, and Eguira. at which latter place the Dutch had formerly a fort, and carried on a considerable trade in gold. Eight leagues E. of cape Apollonia stands the town of Axim, called by some Achembone. (See ACHEMBONE and AXIM.) See ACROX, ADOM, ADOMIR, ANTA, COM-MENDO, &c. &c. The country throughout the Gold Coast abounds in hills, adorned with high and beautiful trees, among which are the palm, the cocoa-nut, the papay, and the banana. The vallies between the hills are wide and extensive, and fit for the plantation of all sorts of fruit; and if they were as well cultivated as watered, they would supply half the coast with provisions. The soil produces in great abundance very good rice, the richest sort of millet with red grain, yams, potatoes, and other roots, all good in their kind. The sugar-cane grows here plentifully, and larger than any where else on the Coast of Guinea. Palm-wine and oil are very good, and very abundant; the country also has plenty of tame cattle and wild beasts. The domestic animals are bulls, cows, sheep, and goats, the last of which are numerous and their flesh is excellent; neither the mutton nor beef is good; but of all animal food dog's flesh is most preferred by the negroes. The wild animals are elephants, tygers, jackalls, boars, deer of various sizes, cats, porcupines, monkeys, rats, mice, &c. &c. Among the birds are pheasants, parrots, maccaws, turtle-doves, and several others. The reptiles are numerous; such as snakes, serpents, vipers, lizards, scorpions, spiders, &c. The coasts, lakes, and rivers abound with fish, and likewise with alligators and gunas, an amphibious animal, resembling the crocodile, and four feet in length. The climate is very hot, from October to March, but during the other months tolerable. The natives are generally healthy; but to Europeans the climate is insalubrious, and often fatal, especially in the months of July and August.

It is observed that of all the countries on the coast of Western Africa, the Gold Coast experiences the most intense heat. But, a modern traveller, near the Volta, has seen Fahrenheit's thermometer as high as 151° in his chamber, and 134° in the open air; surmounting by 26° the greatest heat observed by Adanson on all the banks of the Senegal. Although this traveller advanced only 10 miles from Christianburg on this coast, his journey is curious.

The countries he visited during his short excursion in the interior, are represented as very beautiful, fertile, and populous; they are, in general, woody, but, nevertheless, more healthy than the shores; they are agreeably intermingled with mountains, vallies, and hills. Fresh water, which is scarce and bad on the coast, is here excellent and abundant. About five miles from Christiansburg Fort observed a chain of mountains covered with tall trees, and composed of large grained granite, of gneiss, and of quartz.

The native negroes of the Gold Coast are in general tall, straight, and well-proportioned; with oval faces, sparkling eyes, regular, white teeth, mouths of a moderate size, and lips tinged with a better colour and thinner than those of the negroes of Angola. As to the qualities of the mind, they have a quick apprehension and ready memory, accompanied with an astonishing presence of mind, and equanimity; but they are generally so indolent that mere necessity puts them upon exerting the faculties they possess. In general, they are crafty, fraudulent, and treacherous; thieves, gluttons, and drunkards, and equally incontinent and covetous. When they obtain a victory over their enemies, they return home dancing and singing, and when defeated do the same round the graves of their friends and fellow-soldiers. Alike insensible of grief or joy, they sing till they die, and dance into the grave. The women are proportionably handsomer than the men, straight, slender, and well-limbed; their chests high, their mouths small, and their eyes indicating vivacity and spirit. They are quick, cheerful, and loquacious; gay in their disposition, and loose in their principles as to gallantry, but temperate in their diet. When the men and women overcome their natural indolence, they are laborious, industrious, and ingenious; and apply with activity and diligence to agriculture or fishing, so far as they are excited by poverty or avarice. Their dress is various according to their rank and circumstances; but the rage of dress is chiefly prevalent among the women, who are fond of adorning all parts of their bodies with gold, coral, and ivory trinkets; and this rage they derived from the Portuguese and Dutch, as before their arrival men and women went naked to the age of maturity. They are fond of frequent ablutions, and being accustomed to the use of water, they are excellent swimmers and divers from their youth. Beside the natural inhabitants of the Gold Coast, there is a great number of Melattoes, a mixed progeny, arising from the commerce of Europeans with the black women. This spurious race forms gangs of thieves and plunderers, void of decency, honour, honesty, or principle; in their dealings with each other, with the Negroes, or the Europeans. These call themselves Christians, although they are the grossest of all idolaters, and most of their women prostitute their bodies publicly to Europeans, and privately to the Negroes. The towns and villages of this coast consist of a multitude of little huts or cabins, dispersed in groups, without order or design, and communicating with each other by narrow crooked roads, which terminate in the centre of the town or market place.

It is observable that the further you remove from the sea-coast, the more civilized do the natives appear, at least so far as relates to their mode of building and of living. The common food of the Negroes, in this part of Africa, is a pot of millet boiled to the consistence of bread, yams, and potatoes, over which they pour some palm-oil, and garnish the dish with herbs and putrid fish. This is their meals on common days; and on holidays they feast upon beef, mutton, and fowl. They begin the day with drinking brandy, and conclude the evening with palm-wine, mirth, riot, and tobacco, of which they are extravagantly fond. In eating

they are temperate, but very profuse in drinking. Their marriages are encumbered with few ceremonies, and without any previous courtship; and they are as easily dissolved as contracted. Polygamy is allowed among them; and the women are generally doomed to the most laborious offices; they are obliged to cultivate the ground, sow millet, plant yams, and provide subsistence for the husband, who is idly spending his time in gossiping, drinking, and smoking. The rich, however, have two wives, who are exempted from labour and all servile employments; and to them the management of the house is intrusted, and a sort of authority over all the other women is committed. It is said to be no uncommon expedient among Negroes to marry, in order to obtain a livelihood by the prostitution of their wives. As the wealth of the Negroes consists chiefly in the number of their family, they are anxious for multiplying their children; and a pregnant woman is treated with great tenderness and respect. A child, as soon as it sees the light, is consecrated by the priest, and has three names given to it. Circumcision, it is said, though practised in other parts of Africa, is hardly known on the Gold Coast, except at Acra, where it is performed at the time of baptism or consecration. Besides their lawful wives, the Negroes often keep concubines, who are preferred to their wives, and more tenderly treated; nevertheless their children are reckoned illegitimate. But legitimate children never inherit any paternal fortune, in any kingdom on the Gold Coast, except at Acra. In the countries of Eguira, Axim, Ancobar, Anta, and Adom, there are certain women who never marry, but are dedicated by profession to the public use, and initiated in their vocation in a formal manner. Among the Negroes there is a variety of mechanical arts, in which they are expert; such as the making of wooden and earthen vessels and plates, chair-matting, copper ointment boxes, bracelets, necklaces, rings, and ear-rings of gold, silver, or ivory; and also all sorts of weapons and instruments of war. Their tools, which are rude and simple, consist only of a bone for an anvil, a pair of tongs, a pair of bellows, a chisel, a saw, and a hammer. They can finish with extraordinary exactness bed-ware, and materials of gold, brass, and copper. In building canoes, which are of various sizes, from 30 to 70 feet in length, and three or four feet in breadth, the Negroes are very ingenious; and they are no less dextrous in the use of them. With regard to the husbandry of the Negroes, they sow in the rainy season, the soil at other times being unmanageably hard; sowing maize in elevated and dry situations, and rice or millet in low marshy lands, subject to inundations. The natives of the coast, finding it easy to dispose of all their grain, have established corn markets in every village, and the price of grain, in gold-dust, cowries, &c. is rated by certain officers of police, appointed by the king. Hither the men and women meet from considerable distances, bearing heavy burdens; and the women especially submit to great labour and fatigue in this way, that they may exchange their heavy loads for European commodities, such as looking-glasses, bracelets, ear-rings, glass-beads, and other female trinkets, suited to their taste for dress and finery. The markets are exempted from all duties and imposts. Besides these frequent markets, they have also fairs twice a year for European wares. All the diversions among the Negroes consist of dances, to which they are excessively addicted, music, and mock combats, which often terminate tragically. The principal musical instruments among the Negroes are horns, made of ivory, trumpets, drums of different sizes, and a kind of harp, with six or eight strings.



The honour of the first discovery of the Gold Coast is contended between the French and Portuguese; the French pretend that they were acquainted with Nigritia and Guinea above 100 years before the Portuguese began their discoveries, or about the year 1346 or 1364, but little credit is attached to these accounts of French writers. The Portuguese, it is said, fitted out a ship at Lisbon, under the protection of Don Henry, for the sole purpose of making discoveries along the coast of Africa. At this time Alphonso I. reigned in Portugal. The navigators, it is further said, were driven on an island in the gulf of Guinea, which they called St. Thomas, and where they made a long stay, laying the first foundation of a colony in this island. Having repaired their vessel, they returned to Lisbon, and arrived there in 1484. The Portuguese soon equipped a fleet, and pushed their discoveries as far as Benin, and in process of time arrived in the road of Acra, on the Gold Coast, where they procured a quantity of gold. A number of adventurers from the island of St. Thomas arrived at Elmina four years after the departure of the French. Purchas relates, that Alphonso, having little leisure for pursuing discoveries towards the latter end of his reign, gave an exclusive privilege for five years to Fernando Gomez, a citizen of Lisbon, to sail to the coast of Africa: and a person, depicted by him, says Purchas, discovered Elmina; and during this period, were also discovered the islands of St. Thomas, St. Matthew, Annobon, and del Principe. In 1481 John II. encouraged the commercial spirit of his subjects, and projected further discoveries; and it was probably upon this occasion, notwithstanding the assertions of French writers, that fort St. George de la Mina, or Elmina, had its first rise. John, the successor of Alphonso, conferred many privileges on this new colony. A few years after, the same prince established a Guinea company, with exclusive privileges. In the reign of Henry III. of France, after the termination of the civil wars, the French began to renew their voyages to the Grain and Gold Coast. From this period the credit of the Portuguese began to decline, and other Europeans began to open a commerce with the Coast of Guinea. Among others the Dutch engaged in the warfare, which had been prosecuted between the Portuguese and other Europeans; and by perseverance they made themselves masters of the forts of Elmina and Axim; obtaining, by their courage, that security, which the Portuguese had lost by their insolence and cruelty. The first Dutchman who led the way to Guinea, was one Bernard Erick, in 1595. Running along the Gold Coast, he established a correspondence with the natives, treated them with civility, and alienated their affections from the Portuguese. At length, by their intrigues with the king of Sabo, the Dutch obtained permission to build a fort, three leagues E. of Cabo Corso, or Cape Coast. This fort was finished in 1624, and the Dutch power founded in Guinea, at the time when the States were engaged in a war with Philip IV. of Spain. In the year 1637 they succeeded, after much resistance, in taking the fort of St. George d'Elmina, and in the year 1642 the fort of Axim also fell into their hands. The Dutch, having thus far been successful, proceeded to attack the English settlements. In tracing the first British establishments on the Coast of Guinea, we may begin with observing, that a trade here had been carried on by some private adventurers, without the aid or protection of the government. In 1585 and 1588, queen Elizabeth granted two patents to certain rich merchants of England; one for an exclusive trade to the coast of Barbary, and another for that of Guinea. In 1592 a third patent was obtained by the same body of merchants. In 1651 the republic of Eng-

land encouraged the African trade; and in 1662 Charles II. granted a charter to a body of merchants, under the name of the Royal Company of England trading to Africa, extending their limits from the mouth of the Strait to the Cape of Good Hope. The affairs of this company falling into disorder, the king erected another corporation, called the "Royal African Company," which has subsisted to this day. This charter bears date, Sept. 27, 1672. This company, with a small capital, was diligent and successful; Cape Coast was enlarged and beautified; the forts of Acra, Dixcove, Winchaw, Sukkouda, Commendo, and Ananaboa, were built or repaired, all of them on the Gold Coast, and several within musket-shot of the Dutch settlements. They bought Fredricksburg of the Danes, and built a new fort in Whidah. See *African Company*.

**GOLD Cronach**, a town of Germany, in the principality of Bayreuth, which had formerly a gold mine; 5 miles N. of Bayreuth.

**GOLDAPP**, a town of Prussian Lithuania; 68 miles E. S. E. of Konigsberg—Also, a river of Prussia, which runs into the Romint; 6 miles N. of Goldapp.

**GOLDAST**, MELCHIOR HEIMENSFELD, in *Biography*, a learned writer of the 16th century, was a native of Switzerland. He studied the civil law at Altdorf, but he is better known as a man of letters. His works, though not marked for originality, were highly esteemed by the learned of the period in which he flourished; the principal of these are, 1. "Monarchia Saeculi Imperii Romani," in three volumes folio, published in 1611-14. These volumes consist of a collection of treatises on the civil and ecclesiastical jurisdiction of the empire. "Alemannia Scriptores," three volumes folio, 1730. "Commentarius de Bohemica Regno," 4to. "Informatio de statu Bohemicae quondam Jus," 4to. "Sybilla Francica," being a quarto collection of pieces relative to the maid of Orleans: "Scriptores Rerum Siveicarum." "Collectio Consuetudinum et Legum Imperialium." "Politica Imperialia," and a collection of letters, written to him by several men of learning. This last work was printed at Frankfort in 1688. Mr. Goldast was of a capricious temper and of changeable habits, which prevented him from rising in the world. He died in 1635, having long struggled with poverty. Moreri. Bayle.

**GOLDBERG**, in *Geography*, a town of Silesia, in the principality of Lignitz, deriving its name from a gold-mine in its vicinity, which was formerly very rich. The earth, called sigillata terra, is dug near it; and the inhabitants are employed in the woollen and linen manufactures; 12 miles S.W. of Lignitz. N. lat. 51° 4' E. long. 15° 53'—Also, a town of the duchy of Mecklenburg; 15 miles E. of Wismar.

**GOLDECK**, a town of the archbishopric of Salzburg; 28 miles S. of Salzburg.

**GOLDEN**, something that has a relation to gold, or consists of gold, is valuable like gold, or the like.

**GOLDEN Bull**, *Bulla Aurea*. See *BULL*.

**GOLDEN Calf** was a figure of a calf, which the Israelites cast in that metal, and set up in the wilderness to worship, during Moses's absence in the mount, and which that legislator, at his return, burnt, ground to powder, and mixed with the water the people were to drink of, as related Exod. xxxii.

The commentators have been greatly divided on this article: the pulverizing of gold, and rendering it potable, is an operation in chemistry of the last difficulty; and it is hard to conceive how it should be done at that time, before chemistry was ever heard of, and in a wilderness too! Many, therefore, suppose it done by a miracle; and the rest, who

allow of nothing supernatural in it, advance nothing but conjectures as to the manner of the process.

Moses could not have done it by a simple calcination, nor amalgamation, nor antimony, nor calcination: nor is there one of those operations that quadrates with the text.

Mr. Stahl has endeavoured to remove this difficulty. The method Moses made use of, in making his *aurum potabile*, according to this author, was the same with that which now obtains; only, instead of tartar, he made use of the Egyptian natron, which is common enough throughout the East.

**GOLDEN Cape**, in *Geography*, a cape of England, on the W. coast of Dorsetshire. N. lat.  $50^{\circ} 43'$ . W. long.  $2^{\circ} 50'$ .

**GOLDEN Caps**, a name by which some call the ranunculus, or crow-foot.

**GOLDEN Eye**, in *Ornithology*, the *ANAS CLANGULA*. See DUCK.

**GOLDEN Eye**, a species of fly. See CHRYSOPIS.

**GOLDEN Fleece**, in the *Ancient Mythology*. See ARGONAUTIC.

**GOLDEN Fleece**, *Order of the*, is a military order, instituted by Philip the Good, duke of Burgundy, in 1429.

It took its denomination from a representation of the golden fleece, borne by the knights on their collars, which consisted of flocks and fleeds. The king of Spain is now grand master of the order, in quality of duke of Burgundy: the number of knights is fixed to thirty-one.

It is usually said to have been instituted on occasion of an immense profit which that prince made by wool; though others will have a chemical mystery couched under it, as under that famous one of the ancients, which the adepts contend to be no other than the secret of the elixir, written on the fleece of a sheep.

**GOLDEN Flower**, in *Botany*. See CHRYSANTHEMUM.

**GOLDEN Flower-gentle**, a name sometimes given to several species of the amaranth.

**GOLDEN Head**, in *Ornithology*, a water-fowl, otherwise called *anas arctica*. See DUCK.

**GOLDEN Island**, in *Geography*, a small island at the entrance of the gulf of Darien, in Terra Firma, S. America. N. lat.  $8^{\circ} 20'$ . W. long.  $72^{\circ} 32'$ .

**GOLDEN Lake**, a lake of the island of Borneo. N. lat.  $3^{\circ} 55'$ . E. long.  $115^{\circ} 45'$ .

**GOLDEN Lung-wort**, in *Botany*. See HIERACIUM.

**GOLDEN Maiden-hair**. See ADIANTUM *aurum*, and POLYTRICHUM.

**GOLDEN Mouse-ear**. See HIERACIUM.

**GOLDEN Number**, in *Chronology*. See CYCLE of the Moon, and NUMBER.

**GOLDEN Prebendary of Hereford**. See PREBENDARY.

**GOLDEN River**, in *Geography*, a river of America, which runs into the Mississippi, N. lat.  $43^{\circ} 20'$ . W. long.  $92^{\circ} 2'$ .

**GOLDEN River**, or *Rio del Oro*, a river of America, which runs into the Spanish Main, N. lat.  $14^{\circ} 44'$ . W. long.  $82^{\circ} 55'$ .

**GOLDEN Rod**, or *Saracen's Wound-wort*, *virga aurea*, in *Botany*. See SOLIDAGO.

**GOLDEN Rod Tree**. See BOSEA.

**GOLDEN Rule**, in *Arithmetic*, a rule or praxis of great use and extent in the art of numbers, whereby we find a fourth proportional to three quantities given. The Golden Rule is also called the Rule of Three and Rule of Proportion. See its nature and use under the article RULE of Three.

**GOLDEN Samphire** is a species of the inula or elecampane. (See INFUSA.) It grows naturally on the sea-coasts in many parts of England, and is sometimes sold in the London mar-

ket for the true samphire, though entirely destitute of its warm aromatic taste. See SAMPHIRE.

**GOLDEN Saxifrage**. See CHRYSOPENIUM.

**GOLDEN Stole**, *order of the*. See STOLE.

**GOLDEN Sulphur of Antimony**. See ANTIMONY.

**GOLDEN Thistle**, in *Botany*. See SCOLYMUS.

**GOLDENSTEIN**, in *Geography*, a town of Moravia, in the circle of Olmutz; 32 miles from Olmutz.

**GOLDENSTETT**, a town of Germany, in the country of Diepholz; 11 miles N. of Diepholz.

**GOLDENTRAUN**, a town of Upper Lusatia; 16 miles S.E. of Gorkitz. N. lat.  $50^{\circ} 27'$ . E. long.  $15^{\circ} 26'$ .

**GOLDINGEN**, a town of the duchy of Courland, situated near the river Weta, defended by an old castle, and containing two churches; 48 miles W.N.W. of Mittaw. N. lat.  $56^{\circ} 51'$ . E. long.  $21^{\circ} 44'$ .

**GOLDLAUTER**, a town of Germany, in the county of Henneberg, 12 miles N.E. of Meinungen.

**GOLDMAN, NICHOLAS**, in *Biography*, a mathematician, was born at Breslaw, in Silesia, in the year 1623, and died at Leyden in 1665. The works by which he is generally known are "Elementa Architecturæ Militaris," 1643. "De Usu Proportionarii Circuli." "De Stylometricis," 1662, and another treatise "On Architecture," published in 1696, with numerous engravings, and the life of the author. Moreri.

**GOLDONI, CHARLES**, was born at Venice in the year 1707. Almost from his infancy he gave indication of a humorous character, and a propensity to dramatic performances. Before he could well read he became an author, and wrote the plan of a comedy by the time he was eight years old. This piece possessed so much merit, that it required the testimony of respectable witnesses to verify its being the production of a child. He received the elements of education at Venice, from this city he went to the Jesuits' college at Perugia to study rhetoric, and afterwards he studied philosophy at Rimini. His mind was, however, too deeply engaged in theatrical exhibitions to make the system of Aristotle a predominant pursuit. Every leisure moment he spent at the theatre, till at length he passed from the pit to the stage, and joined a company of players. This, by his own account, was an error, which drew after it many serious consequences. He had been intended by his father for the profession of physic, which he was unable to study: he was then solicited to prepare himself for the bar, and was engaged, after many changes, in practice at the courts of Venice. After this he was appointed secretary to the Venetian resident at Milan, where he became acquainted with the manager of the theatre, and wrote a farce for him, entitled "The Venetian Gondolier," which was performed and printed: by degrees he became united to the company, and composed many pieces for them. He now turned his thoughts towards reforming the Italian stage, and so earnest was he in his projects, that it is said in a single year he wrote sixteen new comedies, besides forty-two other pieces for the theatre, and among these are reckoned some of his best productions. The first edition of his works was published in 1753 in 10 vols. 8vo. After this he published many additional pieces under the title of the "New Comic Theatre." He had composed 59 other pieces so late as the year 1761, and here closes the literary life of Goldoni in Italy. He now repaired to Paris, and was as zealous in his endeavours to reform the Italian theatre there as he had been in his own country. His first attempt was in a piece called the "Father of Love," but the bad success of this comedy was a sufficient warning to him to desist from his undertaking. He continued, during the remainder of his engagement, to produce pieces agreeable to the general taste, and published

twenty-four comedies. At the end of two years he was preparing to return to Italy, when he was suddenly urged to become Italian master to the princesses, aunts to the reigning monarch. During this engagement he lost his sight, which he never after completely recovered, and at the end of three years he received a very inadequate recompence for his labour and the time spent at court, namely, 100 louis in a gold box, and the grant of a pension of four thousand livres per ann. This, with what he was enabled to make by his works, was amply sufficient for all his wants. When he had attained his 62d year he began to publish comedies in the French language, which were well received, and some of them became extremely popular. After the death of Lewis XV. Goldoni was appointed Italian teacher to the princess Clotilde, the present princess of Piedmont, and after her marriage, he attended the unfortunate princess Elizabeth in the same capacity. His last work was the "Volponi," written after he had retired from court. It was his misfortune to live to see his pension taken away by the revolution, and, like thousands in a similar situation, he was obliged to pass his old age in poverty and distress. He died in the beginning of the year 1793, at a period when the Brissotines had the sway in the national councils, and when Goldoni would, for a short time at least, have received every attention that a grateful country could have afforded. As a comic poet, Goldoni is reckoned among the best of the age in which he flourished. His works were printed at Leghorn in 1788-91, in 31 vols. 8vo. He has been reckoned the Moliere of Italy, and he is styled by Voltaire "The painter of Nature." "Goldoni," says his biographer, "is one of those authors whose writings will be relished in the most remote countries, and by the latest posterity. His profound knowledge of the human heart, his extensive description of the vices and virtues of men, in all ages and stations, will justify my concluding this imperfect eulogy with applying to him the following lines of Horace from his first Epistle :

"Æque pauperibus prodest, locupletibus æque

Æque neglectum pueris, senibusque nocebit."

Monthly Magazine, vol. v.

His principal works are comedies in prose, for declamation, of which the exact number is not known; but they at least amounted to 120 before he left Italy at the desire of Louis XV. to write for the "Theatre Italien" at Paris, for which theatre he composed at least 30.

This fertile, natural, and pleasing writer, was ambitious at first of treating serious and tragic subjects; but finding, as he tells us himself in his life and prefaces, that Metastasio was arrived at as high a point of perfection in his serious operas as that species of drama was capable of, he pointed his thoughts wholly to comedy, which had been long treated in such a buffoon and farcical manner, as to stand in great need of reformation.

But though he had determined not to attempt serious pieces for music, yet Galuppi prevailed upon him, much against his inclination, to furnish him with three serious operas for the theatre at Venice; these were, Orontes, king of Scythia; Guilavus Adolphus; and Statira. But though they had great success, Goldoni never thought them worthy of publication. He was not more vain of his comic operas. However, he produced at different times and places 40 or 50, which, without his consent or knowledge, were collected and published in 6 vols. 12mo.; they are not very estimable works, being on the old burletta model, full of buffoonery, and a broad kind of Italian humour, tasted in no other country, though suffered for the sake of the music, which is often ingenuous, imitative, and sometimes graceful, but more frequently grotesque.

Goldoni is, perhaps, the only author of comic operas in Italy, who has given them a little common sense, by a natural plot, and natural characters; and his celebrated comic opera of the "Buona Figliuola," set by Piccini, and first performed in London Dec. 9th, 1766, rendered both the poet and composer, whose names had scarcely penetrated into this country before, dear to every lover of the Italian language and music, in the nation. This admirable production, before it was brought hither, had saved the *Figliuola* of the opera at Rome from ruin, and been performed in the principal cities of Italy. In the year 1769, Piccini, passing through Rome, in his way to Milan, was entreated to compose a comic opera for the Teatro della Dama in that city, which had lately been very unfortunate. No *libretto* was ready, and application having been made to the poet Goldoni, at this time in Rome, he furnished the musical drama of "La Buona Figliuola," from his comedy of "Pamela," in a few days. Several of the original performers were now in London, particularly the first buffo, Lovattini, and the serious man Savoi, with the *lyris caricato* Morigi. And though females are not allowed to appear on the stage at Rome, yet signora Gurdagni had previously performed the part of Cecchina in several cities of Italy, with great and well-deserved applause before his arrival here.

After the great success of the "Buona Figliuola," the public was disposed to hear with partiality any production by the same authors; and when the "Buona Figliuola Maritata," (or Pamela in high life), was brought out, the crowd at the opera-house was prodigious; but expectation, as usual, was so unreasonable as to spoil the feast; to gratify it was impossible. Some ascribed their disappointment to the composer, some to the performers, but none to themselves. The music was excellent, full of invention, fire, and new effects; but so difficult, particularly for the orchestra, that the performers forgot it was winter. The principal part of the Marchesa was given to Zamparini, a very pretty woman, but an affected singer. Music so difficult to perform was not easy to hear; and this drama was never sufficiently repeated for the public to be familiarly acquainted with it. They were glad, as well as the performers, to return to the "Buona Figliuola" for their own ease and relief from a too serious attention.

In France, Goldoni wrote several very successful comedies for declamation in the French language, but we are not acquainted with any dramas which he produced for music in that country. Poor Goldoni was in such favour with the royal family of France before the revolution, that he was never allowed to return to his own country; but died at Paris in the year of *terror*, 1793, at the age of 83.

GOLDSBOROUGH, in *Geography*, a post town of America, in Hancock county and state of Maine, incorporated in 1789, and containing 379 inhabitants; 47 miles E. of Penobscot. N. lat. 44° 10'.

GOLDSINNY, in *Ichthyology*, a fish discovered on the coast of Cornwall, in the whole form of the body, lips, teeth, and fins, resembling the *ceraste*, which is said never to exceed a palm in length; near the tail is a remarkable black spot; the first rays of the dorsal fin are tinged with black. See LABRUS *Cornubiæ*.

GOLDSMITH, OLIVER, in *Biography*, was born in the county of Longford, Ireland, in 1731, though, according to other accounts, this event took place at Elphin, in 1729. He was the son of a clergyman, who gave him a literary education, and sent him early to Dublin college. Being designed for the profession of medicine, he was removed to Edinburgh in 1751, where he continued till 1754, when he left that place to avoid a process against him

For debts incurred, probably to administer to his dissipation. He was intercepted at Sunderland, and thrown into confinement, from which he was released by the kindness of two fellow-colleagues. After this, he determined to visit the continent, embarked for Holland, travelled through Flanders and part of Germany, passed some time at the universities of Straßburg and Louvain; at the latter place he took his degree of bachelor of physic, and thence accompanied an English gentleman to Geneva. Here he engaged himself as travelling tutor to a young man who had become possessed of a large fortune, but whose mind was ill adapted to do credit to the gifts of Providence. They disagreed in the south of France, and Goldsmith was left to contend with the hardships of indigence in a foreign country. He returned in 1758, and had in most of his peregrinations trusted for his support to his own casual efforts. His learning ensured him a favourable reception at the monasteries, and his German flute seldom failed to procure him a meal and a night's lodging from the peasantry, who were delighted with strains which a politer audience would have treated with disdain. His arrival at London with a few pence in his pocket, was not likely to be the termination of his pecuniary distresses. He attempted to get into the employ of an apothecary, but his appearance being against him, his application was treated with disdain. He at length was admitted as usher to Dr. Milner, who kept an academy at Peckham. Here he remained but a short time, and then resolved to follow the profession of an author in London. He obtained some employment in the Monthly Review, and furnished papers for the public Ledger. He published a weekly pamphlet, entitled "The Bee," and "An Enquiry into the state of Polite Learning in Europe." After he had been some time exercising his pen in obscurity, he became on a sudden celebrated as a poet, by the publication of his "Traveller, or a Prospect of Society." This work had lain by him in MS. some years, and it was at the instigation of Dr. Johnson that he prepared it for the press. That great critic declared it as his opinion, that there had not been so fine a poem since the days of Pope. In this decision the public concurred, and the author was, almost immediately, introduced to the most eminent literary characters of the age. In the following year was published his novel of the "Vicar of Wakefield," which had been sold to a bookseller some years before, but had been kept back as the work of an unknown writer, and exciting no expectations of success. It was, however, received with unbounded applause, and has ever since borne a distinguished rank among similar compositions. His next work was a "History of England," in a series of letters from a nobleman to his son, in two volumes 12mo. a work that still continues to be read with great delight. His poetical fame reached its summit in 1770, by the publication of his "Deserted Village," which was universally admired. For this he obtained of his bookseller 100*l.* a sum which appeared to the author to exorbitantly great, that he refused to take it; but the sale of the work convinced him that he might fairly appropriate the sum out of the profits. As an author of comedy, he produced in 1768 "The Good-natured Man," which was not very successful; and in 1772 another play, entitled "She Stoops to Conquer, or the Mistakes of a Night." From this Goldsmith cleared a large sum, and it is still occasionally represented to applauding audiences. Notwithstanding the success of his pieces, by some of which it is asserted he cleared 1800*l.* in a single year, his circumstances were never very prosperous, which was partly owing to the liberality of his disposition, and partly to an unfortunate habit which he had contracted of

gaming; the arts of which he knew very little of, and consequently became the prey of those who were base enough to take advantage of his simplicity. Besides the works already treated of, Dr. Goldsmith, as he was called, though he had only taken a bachelor's degree, compiled an English history in four volumes, and a Roman and Grecian history in two volumes each; and "A History of the Earth and Animated Nature," in eight volumes 8vo. Such was the confidence which he acquired in his skill at compilation, that he formed a plan for a much greater work, viz. "A Dictionary of Arts and Sciences," but this and other schemes which he had planned were cut off by his untimely death. A despondence of mind, probably occasioned by the consciousness of the bad state of his affairs, had been secretly preying upon him, when in March 1774 he was attacked with the symptoms of a low fever, under which he sunk on the 4th of April. He was buried in the Temple church-yard without much attendance, but a monument has since been erected to his memory in Westminster abbey, with a Latin inscription by Dr. Johnson.

Goldsmith, as a man, was rather admired for his genius, and beloved for his benevolence, than solidly esteemed. The best part of his moral character was a warmth of sensibility, which made him in all fortunes ready to share his purse with the indigent, and rendered him in his writings the constant advocate of the poor and oppressed. The worst feature was a malignant envy and jealousy of successful rivals, which he sometimes displayed in a manner not less ridiculous than offensive.

As a writer, no one of his time was possessed of more true humour, or was capable of more poignancy in marking the foibles of individuals. This last talent he displayed in a very amusing manner in his poem entitled "Retaliation," written as a retort to the jocular attacks made upon him in a club of which he was a member. His literary fame stands highest as a poet, in which character a place may be given him perhaps at the head of the minor class, the term minor being applied with relation to the quantity, rather than the excellence of composition. "It would not be easy," says his biographer, "to point out in the whole compass of English poetry, pieces that are read with more delight than "The Traveller;" and "The Deserted Village." The elegance of the versification, the force and splendour yet simplicity of the diction; the happy mixture of animated sentiment with glowing description, are calculated to please equally the refined and the uncultivated taste. The moral and philosophical views of society they exhibit are, indeed, objectionable; yet upon the whole they exert a favourable influence over the heart. In addition to these capital works, his pleasing ballad of "The Hermit," and some short humorous and miscellaneous pieces, complete the catalogue of his performances in verse. As a prose writer he deserves high praise for style, which he adapts with great felicity to his subject, and which, whether elevated or plain, is always clear, pure, and unaffected. Life prefixed to his poems. Europ. Mag. Ann. Regis.

GOLDWIN, JOHN, an ecclesiastical composer, was brought up under Dr. William Child, and, in 1697, succeeded him as organist at the free chapel of St. George at Windfor. In 1703 he was appointed master of the choiristers there, in both which stations he continued to the time of his death in 1719. Dr. Boyce, out of a great number of anthems by this composer, selected one for four voices, "I have set God always before me," which he has inserted in the second volume of his "Collection of Cathedral Music," and well characterized it with respect to the modulation, by saying that "it is singular and agreeable."

**GOLDYLOCKS**, in *Botany*. See *CHRYSOCOMA* and *GNAPHALIUM*.

**GOLEEAH**, in *Geography*, a town of Bengal; 18 miles E. of Rangur. N. lat. 22° 28'. E. long. 85° 51'.

**GOLETTA**, a fortress of Africa, situated on a canal, in the kingdom of Tunis; 25 miles N. of Tunis.—Also, a narrow channel between the lake of Tunis and the sea, defended on each side by a castle.

**GOLF**, or **GOUF**, the name of a diversion or exercise, much used in Scotland, and played upon the lawns or links, as they are there called.

It consists of driving a ball with clubs, between two goals or holes, half a mile or a mile asunder. He who can do this with the fewest strokes of his club is the conqueror.

**GOLFO TRISTE**, in *Geography*, a bay on the coast of South America, in the government of Caracas. N. lat. 10° 30'. W. long. 68° 20'.

**GOLGAM**, a town of Hindoostan, in Dowlatabad; 15 miles N. of Beder.

**COLGOM**, a town of the island of Ceylon; 48 miles N.W. of Candy.

**GOLGOTHA**. See *CALVARY*.

**GOLIATH**, in *Scripture History*, a famous giant of Gath, who defied the armies of Israel, and was slain by David. 1 Sam. xvii. 4, &c.

**GOLICH**, in *Geography*, a town of Russia, in the government of Irkutsk, on the Lena; two miles S. of Or-lenga.

**GOLINDA**, a small island near the N. coast of Cuba. N. lat. 23° 25'. W. long. 80° 4'.

**GOLISANO**, a town of Sicily, in the valley of Demona; 9 miles S. of Cefalu.

**GOLITZ**, a town of Nubia, on the left side of the Nile; 45 miles W.N.W. of Dongola.

**GOLIUS, JAMES**, in *Biography*, was born at the Hague in 1596; but he pursued his studies at Leyden with the most unremitting diligence and ardour, and became distinguished for his deep knowledge of the learned languages, antiquities, philosophy, and mathematics. In 1622 he accompanied an ambassador of the United Provinces to Morocco, where he excited the admiration of the emperor Muley Zeidan, with whom he had frequent interviews. After his return to his native country he succeeded to the Arabic professorship on the death of Erpenius, under whom he had formerly studied. In 1625 he obtained permission to travel in the Levant, and passed more than a year at Aleppo, whence he made various excursions into Arabia and Mesopotamia. On his return he visited Constantinople, where he obtained very distinguished notice from the learned in that capital, by whose means he had access to the best libraries. During his absence he was appointed professor of mathematics, and returned to Leyden in 1629, and applied himself to the duties of his office. He died in 1667, having occupied with much credit the arduous situation of professor for more than forty years, and passed through all the academical honours. As an author he published the "Saracen History of Elmaein," which had been begun by Erpenius; also a life of the great Tamerlane, written by an eminent Arabian author: "The astronomical Elements of Alfergan," with a new version and learned commentaries: "An Arabic Lexicon;" a "Persian Dictionary," which was printed in London. Bayle. Moreri.

**GOLUS, PETER**, brother of the preceding, entered when very young among the Carmelites; like his brother he excelled in the knowledge of the Arabic language, and taught it in the seminary belonging to his order at Rome,

where those monks were educated who were intended to be sent on missions into the East. Golus was destined to this service, and having visited every part of Syria and Palestine, founded a monastery of his order on mount Libanus, over which he presided till he was recalled to Rome. Here he was employed as one of the principal assistants of Sargius Rufus, archbishop of Damascus, in preparing his edition of the Arabic bible, which was published in 1671 by the direction of the college "De Propaganda." After it was completed, Golus was appointed visitor of the missions of the East Indies. He died in this employment at Surat about the year 1673. He was author of translations into Arabic of Thomas a Kempis' imitation of Jesus Christ; of sermons on the Evangelists: an "Historic discourse of St. Gregory of Decapolis;" several small devotional pieces, and a translation from Arabic into Latin of a "Collection of Parables and Proverbs." Moreri.

**GOLLI**, or **COLLI**, in *Geography*, a town of Africa, near the river Grande, the inhabitants of which trade in slaves, ivory, and cotton.

**GOLLING**, a town of the archbishopric of Salzburg, on the Sulza; 14 miles S.E. of Salzburg.

**GOLLOSING**, a town of Bengal; 70 miles W. of Midnapour.

**GOLNITZ**, a town of Hungary, on a river of the same name; 14 miles S.E. of Kapidorff.

**GOLNOW**, a town of Anterior Pomerania, formerly Hanseatic, situated on the Ihna; 12 miles N. of Stargard. N. lat. 53° 37'. E. long. 24° 57'.

**GOLLO**, a river of Corsica, which rises nearly in the centre of the island, and pursuing a N.E. course, runs into the sea; 12 miles S.S.E. of Bastia. It gives name to one of the two departments into which the island is divided; the other being Liamone. Golo comprehends the northern division of Corsica, in N. lat. 42° 30', and containing 165 square leagues, and 103,466 inhabitants, is subdivided into three circles, *viz.* Bastia, whose inhabitants are 47,842; Calvi, having 20,282 inhabitants; and Corte containing 35,342 inhabitants. There are several lofty mountains near the centre of a chain that traverses the island longitudinally. The most considerable lakes are Ino and Creno, the former of which is of unknown depth. The soil is tolerably fertile, yielding barley, millet, olives, chestnuts, wine, fruits, &c. On the hills are forests and excellent pastures. See *CORSICA*.

**GOLOBGUNGE**, a town of Bengal; 10 miles E. of Silhet.

**GOLPHINGTON**, the chief town of Washington county and state of Georgia, in America, situated near the head of Ogeechee river, about 26 miles E.S.E. of Occanee town.

**GOLPS**, in *Heraldry*, are roundles, or torteaux, of a purple colour.

**GOLTBURGENSIS TERRA**, in the *Materia Medica*, a whitish earth, used in the shops of Germany and Italy as an astringent, a cordial, and a sudorific, but little known among the English apothecaries. It is dug in many parts of Germany, as Goldberg and Strigaw, and Lignitz in Silesia; but particularly at this time in the neighbourhood of Hasselt, in the bishopric of Liege, in the circle of Westphalia. It is taken up there in considerable quantities, and usually is sealed with the impression of an eagle, and with its old name Goltbergenis terra under it. It was imagined to contain some particles of silver, and thence to derive some of its virtues: on this account Montanus called it *argentaria terra*; but experience shows that it doth not contain a particle of that metal. It is a dense compact

compact earth of a dull greyish white, soft and friable, and adheres firmly to the tongue, and makes no effervescence with acids.

**GOLTAVINA**, in *Geography*, a town of Russia, in the government of Tobolsk; 188 miles E. of Ensisik. N. lat. 58° 20'. E. long. 98° 14'.

**GOLTPACH**, a town of Prussia, in the palatinate of Culin; 8 miles N.E. of Thorn.

**GOLTVA**, a town of Russia, in the government of Kiev; 112 miles S.E. of Kiev. N. lat. 49° 15'. E. long. 33° 14'.

**GOLTZEN**, a town of Lower Lusatia; 10 miles W. of Lubben. N. lat. 51° 58'. E. long. 13° 30'.

**GOLTZIUS**, **HENRY**, in *Biography*, a painter, who was born at Venlo in 1520, and studied under Lambert Lombard. Becoming enamoured of the antique by having copied several works of that class, he resolved to cultivate his taste by visiting the more important Greek works preserved at Rome; and therefore travelled to that city, where he resided some time, and thence drew an ample stock of materials for his future progress in the art he professed.

He lived principally at Antwerp, where he painted the history of Jason; but as he was engaged in a variety of studies, his pictures are rare. Among other things he investigated coins and medals, and published a collection of them with critical annotations. He died at the age of 63.

**GOLTZIUS**, **HENRY**, an artist of considerable talent, who practised both painting and engraving. As a painter, he drew his resources from the study of the antique, of Raphael, Polidoro, and Michael Angelo; the last of whom appears to have been his favoured Apollo in the art, but whose faults he exaggerated in an outrageous manner, seldom attaining any of his beauties. Hence his style of design is inflated and caricature; and his expressions participate of the same taste; but his sense of hue in colour is rich, vigorous, and transparent. He died in 1617, aged 59.

**GOLUB**, in *Geography*, a town of Prussia, in the territory of Culin; 24 miles S.E. of Culin.

**GOLUBENSKA**, a town of Russia, in the country of the Cossacks, on the Don; 200 miles E.N.E. of Azoph.

**GOMAHNV**, a town of Hindoostan, in the circle of Mohurgunge; 45 miles N.W. of Harriopour.—Also, a town of Bengal; 8 miles S.S.E. of Goragot.

**GOMAR**, **FRANCIS**, in *Biography*, celebrated as the great opponent of Arminius, and from whom the Calvinistic party in Holland received the name of "Gomarists," was born about the year 1563 at Bruges. His parents had been brought up in the Roman Catholic religion, but having embraced the Protestant doctrines, they retired into the palatinate in 1578, for the sake of professing their principles in peace and security. Their son Francis was sent to Strasburg for his education, and pursued his studies there under the celebrated John Sturm, after which he went to Newstadt, whither the professors of Heidelberg had been obliged to retire by the elector Lewis, because they were the opponents of the Lutheran faith. In 1582 he took a journey to England, and attended the divinity lectures at the universities of Oxford and Cambridge. He was admitted to the degree of B.D. in the year 1584. By great assiduity he became very deeply learned in the Greek and Hebrew languages, and in 1587 he settled with a Dutch congregation at Frankfort, and continued to discharge his ministerial functions in that connection, until the year 1593, when his flock was entirely dispersed by persecution. In the following year he was invited to accept the theological professorship at Leyden, and having taken his degree of D.D. he entered upon the duties of his new station. In 1603 Armi-

nius was appointed his colleague, and openly and zealously opposed the gloomy doctrines maintained by John Calvin, and made many converts in the university. This roused the attention of Gomar, who declared himself his opponent, disputed with him in the schools of Leyden, and published treatises to excite the orthodox to make a firm stand against his doctrines, which he represented to be profane and impious; he went much farther, and endeavoured to provoke against him the indignation of the States of Holland, before whom the two combatants disputed twice in the year 1608. On one occasion, when Barneveld exclaimed that he was grateful to God that their controversies did not affect the fundamental articles of the Christian religion, Gomar protested "that he could not appear before the throne of God with Arminius's errors," thus vainly setting limits to the mercy of the most high and most merciful God. In 1611, seeing that his opponents increased in numbers and in strength, Gomar resigned his office, and retired to Middleburg. After this, he accepted the professorship of divinity, first at the academy of Saumur, and then at the university of Groningen, and at the latter place he was employed as the Hebrew professor, in addition to that of theology. He was present at the synod of Dort, and took an active part in procuring the infamous decrees by which the Arminians were condemned and proscribed as corrupters of the true faith, and enemies to their country. He died at Groningen in 1641, leaving a distinguished character for sound learning, particularly in the Oriental languages, but it cannot, and it ought not to be concealed, that he disgraced the character of a Christian minister by his bigotry and intolerance. As an author, he published many treatises, but chiefly on controversial subjects, which were collected and printed at Amsterdam in the year 1645. He was also concerned in revising the translation of the Old Testament, printed at Leyden with notes in the year 1637. Moreri. Bayle.

**GOMASTAHPOUR**, in *Geography*, a town of Bengal, 42 miles N.W. of Nattore.

**GOMAUN**, or **KEMAOON**, the name of mountains of Asia, called also those of Sewalic; an extensive ridge, which seems to form the exterior barrier of the Thibetian Alps in Sirinagar, &c.

**GOMBAULD**, **JOHN OGIER DE**, in *Biography*, a French poet of the seventeenth century, was the younger son of a gentleman of the Protestant religion, to which he adhered. He was educated at Bourdeaux, and came to Paris about the time of the death of Henry IV., and frequented the court of Mary de Medicis. Of her he obtained a pension of 1200 crowns, which was but ill-paid, and which was soon reduced nominally to one-third of that sum, so that, notwithstanding his high patrons, he passed much of his life in a state little above indigence. He was elected one of the first members of the French Academy, and was so extremely zealous for its great object, the purity of the language, that he once proposed to the academicians that they should bind themselves by oath to use no words but such as were approved by the majority of the society. He lived to a good old age, and died in 1666. He was author of many tragedies, tragi-comedies, pastorals and romances, sonnets, epigrams, &c. He also engaged in theological controversy, and wrote "Treatises and Letters concerning Religion," in favour of the Protestants. Gombauld was very ready at repartee, and his wit did not leave him even in old age, for his latest publication was a collection of epigrams. Moreri. Bayle.

**GOMBERT**, **NICOLAS**, a disciple of Jusquin, who published two books of motets for many voices in 1552. He set to music a Latin epitaph on his master Jusquin;



quin; and at this time composers being scarce, he gained some reputation among those of Flanders, with very little genius. For after performing the tedious task of scoring the music of the nania on Jutquin, we found its chief merit to consist in imitations of his admirable master. This composition was in the third ecclesiastical mode of E, with a minor second, as well as third; which M. Blainville some years ago wished to pass on the public for a third or new key, different from the major and minor, which comprise all secular music at present. And it is extraordinary, that this pretension should have had any abettors in a Roman Catholic country, where old compositions in this mode are daily performed in cathedrals and collegiate churches. However, it was a matter of wonder and debate, during some time, in France. See *Mercur de France*, 1751, and *Diction. de Mus. par Rousseau*, art. *Mole*.

**GOMBERVILLE, MARIN LE ROI, *Seur de***, a man of letters, was born at Chevreuse, in the diocese of Paris. He became distinguished at the age of fourteen by a collection of quatrains in honour of old age. In 1635 he was so much distinguished for a literary reputation, that he was of the number assembled by cardinal Richieu for the purpose of founding the French academy. He had published romances and works of a light nature, of which he afterwards seemed to be ashamed, for at the age of forty-five he formed the resolution of consecrating his pen to religion. He even adopted a penitentiary course of life, and is mentioned by some of his contemporaries as having joined the Christian virtues to those of morality. He died in 1674, leaving behind him many works, of which perhaps the best is a "Discours sur les Vertus et les Vices de l'Histoire et de la Maniere de bien écrire." This is deemed a sensible and very judicious performance. Moreri.

**GOMBEY**, in *Geography*, a town of Africa, in Botonga, on the Zambeze. S. lat. 18. E. long. 36 3'.

**GOMBEZCALA**, a town of Persia, in the province of Farsistan; 100 miles N.N.W. of Schiras.

**GOMBIN, GAMBIN, or *Gabin***, a town of Poland, in the duchy of Warsaw, situated on the river Bura; 34 miles N.N.E. of Rawa.

**GOMBRON.** See **GAMBRON**.

**GOMER**, in *Scripture History*, the son of Japheth (Gen. x. 2.) and, according to Josephus, father to the people of Galatia. The ancient inhabitants of that country were called Gomares before the Galatians seized possession of it. The Chaldee places Gomer in Africa; Bochart in Phrygia, because Phrygia, in Greek, has the same signification (a coal) as Gomer, in Hebrew and Syriac. Others are of opinion that the ancient Cimbri, or Cimmerians, sprung from Gomer, and probably from them the Welsh, called Cymri. It is not improbable, that Gomer, or the Gomerites, his descendants, peopled likewise Germany and Gaul; the name German not differing much from Gomerim. Clavier (*German. Antiq.* l. i. c. 5 6.) conjecturing that the ancient Celtica comprehended Illyria, Germany, Gaul, Spain, and the British isles, as all these people anciently spoke the same language, farther supposes, that Gomer, or his family, peopled the countries in Asia, between the Parnamisus and mount Imaus, and between the confluence of the Oxus and Oby; whence these people are called Gomares by Ptolemy (l. vi. c. 17.) and Mela (l. i. c. 2.).

**GOMER**, or *Omer*, an Hebrew measure. See **CORUS**.

**GOMERA, or VELEZ DE PEGNON**, in *Geography*, a castle of Africa, in the country of Fez, built on a rock near the coast of the Mediterranean. Before this fort there was anciently a city, called "Bedis," supposed to have been founded by the Carthaginians. The Arabs called it Belis and

Velis, whence Velis. These two places, surrounded by mountains and forests, were supported by the building of ships for fishing and piracy, before they were taken by the Spaniards. — Allo, a river of Fez, which runs into the straits of Gibraltar, near the above-mentioned fortress.

**GOMERA, or *Gemera***, one of the Canary Islands, 20 or 25 miles long and 15 broad, having a capital of the same name, situated on the east coast, with a good harbour. The island is fertile and well cultivated, and produces sugar-canes and vines in abundance, as well as silk, together with sufficient corn for the supply of the inhabitants, who amount to about 7000; 18 miles S.W. of Tenerife. N. lat. 28 6'. W. long. 17 8'.

**GOMETRA**, one of the western islands of Scotland. This is a small island at the west end of Ulva, tolerably fertile, but without wood.

**GOMEZ DE CIVIDAD REAL ALVAREZ**, in *Biography*, a modern Latin poet, was born in 1588 at Guadalaxara in Spain. He was page of honour to archduke Charles, afterwards emperor. As an author, which entitles him to a place in this work, he possessed a great facility in writing Latin verse, which is seen by his "Thalia Christiana," or the triumph of Jesus Christ, in twenty-five books; "Musa Paulina," or the epistles of St. Paul, in elegiac verse: the Proverbs of Solomon, and other works of a similar kind. His work on the order of the Golden Fleece, entitled "De Principis Burgundi Militia quam Velleris aurei vocant," is reckoned his master-piece. The subject which he chose in this instance was more favourable to poetry than the others. Moreri.

**GOMEZ DE CASTRO, ALVAREZ**, a native of St. Eulalia, near Toledo, was educated at Alcala, where he obtained a high character for diligence and real learning. He was patronized by Philip II., who engaged him to prepare an edition of the works of Isidore, which death prevented him from completing. He was author of many works; but the chief, and that which is most esteemed, is a "Life of Cardinal Ximenes," inserted in a collection of the writers on Spanish history. Gomez died in 1582, at the age of 65. Moreri.

**GOMEZ, MAGDALEN-ANGELICA POISSON**, born at Paris in 1684, was the daughter of Paul Poisson, an actor. Her fertile pen produced a great variety of romances and other works of the entertaining kind. The principal are, "Les Journées Amusantes," in eight volumes. "Anecdotes Persanes," two vols. "Hist. Secrete de la Conquête de Grenade." "Histoire du Comte d'Oxford avec celle d'Eulache de St. Pierre." "Les cent Nouvelles." She died in 1770, at the age of 86.

**GOMEZ, SEBASTIANO**, a Mulatto slave of the Spanish painter Murillio, who employed his leisure hours in painting, and obtained considerable success. The city of Seville is, or was, adorned with many of his works: the most conspicuous among them were a "Madonna with the Infant," in the parterre of Los Mercenarios Descalzos, and the "Flagellation of Christ," at the Capuchins. It is not known at what period he died; but he is said to have survived his master, whose decease happened in the year 1685.

**GOMGAI**, in *Geography*, a town of Hindoostan, in the circar of Surgooja; 22 miles S.W. of Surgooja.

**GOMI**, a town of the province of Gurjel, on the Black sea.

**GOMMERN**, a town of Saxony, on the Elbe; 8 miles E. of Magdeburg.

**GOMNIAL PAR**, a town of Hindoostan, in the circar of Guntoor; 15 miles E. of Innaconda.

**GOMORA,**

GOMORA, a small island in the East Indian sea, near the west coast of Oby. S. lat. 1 52'. E. long. 128°.

GOMORRHA, in *Ancient Geography*, a town of Palestine, and one of the principal cities of the Pentapolis, consumed by fire from heaven. It was probably the most northern of the five cities. Gen. xix. 24.

GOMOZIA, or GOMEZIA, in *Botany*. See NERTERIA.

GOMPHIA, from *γούφοι*, a nail or knob, alluding to the form of the receptacle of the fruit. Schreb. 291. Willd. Sp. Pl. v. 2. 569. Mart. Mill. Dict. v. 2. (Jabotapita; Plum. Gen. 41. t. 32. Ochna; Gærtn. t. 70. Juss. 282.) Class and order, *Decandria Monogynia*. Nat. Ord. *Magnoliæ*, Juss.

Gen. Ch. *Cal.* Perianth inferior, of five lanceolate, sharpish, ribbed, coloured, deciduous leaves, two of which have a membranous margin at each side, one on one side only, and two are destitute of any. *Cor.* Petals five, spreading, longer than the calyx, rather unequal; the claws are shorter than the calyx, each gradually widening into a roundish, flat, entire border. *Stam.* Filaments ten, very short, thick and angular; anthers erect, shorter than the calyx, square, tapering upwards, bursting at the top, on the outside, by two pores. *Pist.* Germen placed on a short fleshy angular receptacle, with five angles and five divisions; style longer than the stamens, marked with five furrows; stigma acute. *Peric.* Drupas from one to five, most generally two, ovate, obliquely attenuated at the base, somewhat compressed, obtuse, erect, standing on a very large globose receptacle, which is undivided, if the berry be solitary, lobed if there be more, one lobe being appropriated to each berry. *Seeds* solitary, ovate.

Eff. Ch. Calyx five-leaved, inferior. Petals five, with claws rather unequal. Anthers nearly sessile, square, opening by two pores. Drupas standing on a rounded fleshy receptacle.

Vahl and Swartz describe five species, all trees, natives of tropical climates. The chief and original one is *G. Jabotapita*, (Ochna Jabotapita; Linn. Sp. Pl. 732. Jabotapita pyramidato flore luteo, fructu rubro; Plum. Ic. 147. t. 153.) This is a native of South America, flowering in December and January. The wood is soft and tough. Leaves simple, as in the whole genus, alternate, stalked, ovate, acute, serrated. Flowers in terminal clusters, yellow, fragrant, compared by Marcgrave to those of a Wall-flower in figure, or rather colour, but he says their scent is sweeter. The fruit and its receptacle are black, juicy, astringent.

This genus is certainly very nearly related to *Ochna*, both in habit and character.

GOMPHIASIS, from *γούφοι*, a nail, a disorder of the teeth, in which they become loose and painful. The connection of the derivative with the Greek is imputable to the circumstance of the teeth being fixed in their sockets, like nails in a piece of wood.

GOMPHOCARPUS, in *Botany*, from *γούφοι*, any thing swelling upwards from a narrow base, as a nail, wedge, or club, and *καρπός*, fruit, alluding to the tumid follicles. Brown *Aftelepiad.* (from the Wernerian Society's Transactions) 26. The genus is confounded by Linnæus under his *Aftelepias*. Class and order, *Pentandria Digynia*. Nat. Ord. *Contorta*, Linn. *Apocinea*, Juss. *Aftelepiadæ*, Brown.

Gen. Ch. *Cal.* Perianth inferior, small, in five acute, permanent segments. *Cor.* of one petal, regular, in five deep, reflexed segments, deciduous. Nectary of five hooded-leaves, simple within, furnished with a tooth at each side, placed on the top of the united filaments. *Stam.* Filaments five, cohering; anthers of two cells, terminated by a

membrane, and producing two compressed masses of pollen, which attach themselves by a taper point to the stigma, and remain pendulous there. *Pist.* Germens two, superior, ovate, styles two, very short, standing close together; stigma common to the two, dilated, horizontal, flat, with five angles to receive the masses of pollen. *Peric.* Follicles two, inflated, ovate, pointed, clothed with soft spines. Receptacles membranous, longitudinal, linear, at length separate. *Seeds* numerous, imbricated, pendulous, crowned with silky down.

Eff. Ch. Corolla in five deep reflexed segments. Nectary of five hooded leaves, simple, with a single tooth on each side, crowning the filaments. Anthers terminated by a membrane. Stigma depressed, pointless. Follicles inflated, prickly. Seeds hairy.

This genus is separated from *Aftelepias* by Mr. Brown, (whose essay on the whole order, and whose discovery of the mode in which the pollen is projected by the anthers upon the stigma, do him the highest honour,) on account of the inflated prickly fruit, and the singular horns which in *Aftelepias* grow out from the bottom of the nectaries. It consists of *Aftelepias arborefcens*, Linn. Mant. 216; *fruticosa*, Linn. Sp. Pl. 315; and *setosa*, Vahl. Symb. v. 1. t. 8; and, as Mr. Brown suspects, of *crifpa*, Linn. Mant. 215. Suppl. 170. *A. pubescens*, Linn. Mant. 215, is, as he justly observes, on the authority of the late excellent Mr. Dryander, borrowed from the Linnæan herbarium, the same plant as *arborefcens*, with a synonym from Plukenet (t. 139. f. 1.) and Morison, which is presumed to be *crifpa*.

GOMPHOLOBIUM, so named by the writer of the present article, from *γούφοι*, a wedge, club, or any thing swelling upwards from a narrow base, and *λόβος*, a pod, or legume, expressive of its tumid fruit. Sm. Tr. of Linn. Soc. v. 4. 220. Ann. of Bot. v. 1. 505.—Class and order, *Decandria Monogynia*. Nat. Ord. *Papilionacæ*, Linn. *Leguminosæ*, Juss.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, coriaceous, short, bell-shaped, in five deep, oblong, pointed, unequal segments. *Cor.* papilionaceous. Standard very large, inversely heart-shaped, carinated at the back, recurved, with a short claw. Wings shorter than the standard, parallel, horizontal, with a prominent lobe on one side near the base. Keel the length of the wings, of two half-ovate, tumid, clawed petals, with a reverted tooth at the upper edge of each. *Stam.* Filaments ten, concealed in the keel, awl-shaped, distinct, ascending, rather unequal in length; anthers vertical, roundish, two-lobed. *Pist.* Germen stalked, oblong, somewhat cylindrical; style awl-shaped, ascending, as long as the stamens; stigma simple, acute. *Peric.* Legume on a stalk, nearly globular, inflated, of one cell, crowned with the style. *Seeds* several, roundish, ranged along the upper future on short stalks.

Eff. Ch. Calyx bell-shaped, simple, in five deep segments. Corolla papilionaceous. Stigma simple. Legume inflated, globose, of one cell, with many seeds.

Five species of this genus are defined in the Transactions of the Linnæan Society, v. 9. 249, *G. grandiflorum*, Exot. Bot. t. 5:—*latifolium*, (*sinubriatum*; Exot. Bot. t. 58:) *scabrum*, a species communicated by Mr. Menzies; *minus*, very near the last, except in the acute recurved points of the leaves; and *pinnatum*, a small species from Port Jackson, remarkable for its pinnate leaves, and zig-zag herbaceous stem. Probably the subsequent volume of Mr. Brown's Prodrum will add more to this number.

The habit of *Gompholobium* is marked by the compound (ternate or pinnate) leaves, and a certain aspect of rigidity and smoothness. The stipulas are not istracoliaceous as in

*Tutenza*, but stand on each side of the base of the common footstalk, being a pair of acute flat clove-pressed leaves, extremely minute, and often altogether wanting. The flowers are yellow, generally numerous, large and handsome; in *G. feabrum* they are purple when dried, but this is suspected to be an alteration of their original hue, and they are judged, from the analogy of *Diosfia*, to be yellow, with crimson keel and wings, when fresh.

All the species, as far as hitherto known, are natives of New Holland. S.

GOMPHIOSIS, in *Anatomy*, from *γομῖος*, a nail, denotes the manner in which the fangs of the teeth are fixed in their sockets.

GOMPHIRENA, in *Botany*, a name adopted by Linnaeus from Dalechamp, and which is perverted from the *Gromphena* of Pliny. Linnaeus made it classical by an allusion to *γομῖος*, a nail, *zedge*, or *club*, which can but obscurely apply to the round head of flowers. See GROMPHIRENA — Linn. Gen. 123. Schreb. 172. Willd. Sp. Pl. v. 1. 1321. Mart. Mill. Dict. v. 2. Ait. Hort. Kew v. 1. 318. Juss. 88. Lamarek. Illustr. t. 180. Gertn. t. 128. (Amaranthoides; Tournef. t. 429) — Class and order, *Pentandria Digynia*. Nat. Ord. *Holeracea*, Linn. *Amaranthi*, Juss.

Gen. Ch. reformed. Cal. Perianth inferior, coloured, membranous, permanent, double; the outer of two large, compressed, keeled leaves, cohering by their inner margins, and one smaller; inner in five deep, awl-shaped, upright, downy segments. Cor. of one petal, tubular, cylindrical, the length of the inner calyx; its margin equally five-cleft, spreading. Stam. Filaments five, very short, inserted into the orifice of the corolla, betwixt its segments; anthers erect, roundish, closing the mouth of the corolla. Pist. Germen ovate, pointed, superior; styles short, cohering at their bottom part; stigmas simple, obtuse, scarcely reaching to the filaments. Peris. Capsule roundish, membranous, of one cell, burbling all round. Seed solitary, large, roundish, with an oblique point.

Ess. Ch. Calyx coloured, the outer of three unequal leaves; inner in five deep segments. Corolla cylindrical, five-toothed, bearing the filaments at its orifice. Capsule burbling all round. Seed solitary.

The species of *Gomphrena* come under the denomination of Everlastings, or Amaranths, on account of the permanent nature of their calyx when dried, which retains its original colour and splendour.

*G. globosa*, Globe Amaranth, a native of India, is commonly raised on a hot-bed, and planted out in our borders, like other tropical annuals. It is also frequently kept in pots to decorate the stove or green-house. The original crimson sort is much more handsome than the paler variegated variety.

*G. perennis*, figured in Dill. Hort. Elth. t. 20. a native of Buenos Ayres, is scarcely cultivated but in curious gardens, having small heads of yellowish flowers of no remarkable beauty.

There are eight species besides in Willdenow, of which the *arborescens*, Linn. Suppl. 173, is by far the most remarkable. This was not sent to Linnaeus by Mutis from New Granada, as erroneously asserted by the younger Linnaeus in the *Supplementum*, but by Vandelli, who received it from Brazil, and who has described it under the name of *Bragantia*, in his *Fasc. Plant. p. 6*. The stem is woody, round, leafy, clothed with rigid, prominent, brown hairs, as are also the leaves, which are opposite, obovate, obtuse, entire, about three inches long, and half as broad. Heads terminal, solitary, the size of an African Marigold or *Tagetes*, pale red or whitish, composed of innumerable

flowers, the segments of whose calyx are about a line long, linear, acute and chafly, clothed in their lower part with long dense silky hairs. We know of no figure of this fine plant.

Mr. Brown, Prodr. Fl. Nov. Holl. v. 1. 316, added a new species to *Gomphrena*, which he removed from *G. brachylopha* and *vermicularis*, which, with two more, inhabit the tropical part of New Holland. He turns into a new genus, *Philoxerus*. He could not see what we term the tube of *Gomphrena*, as the tube of the united filament.

GOMPHRENA, in *Gardening*, contains a plant of the flowery annual kind, of which the species cultivated is the annual globe amaranth (*G. globosa*).

It is a fine flowering plant, the heads of which at their first appearance are globular, but as they begin to enlarge become oval, and, according to Martyr, the flowering heads are extremely beautiful, and, if gathered before they are too far advanced, retain their beauty several years.

There are varieties with fine bright purple heads, with white or silvery heads, which never alter from seed, with mixed colours, with purple and with white heads, which two last are much smaller and rounder than the others; the plants also grow much larger and spread more into branches, and are later before they flower; these are called *batchelor's buttons* in America.

*Method of Culture.*—It may be increased by sowing the seeds annually, in pots of light fresh mould, in the early spring months, and plunging them in the back hot-bed. When the plants are up, they should be watered often with care; and, after they have attained some growth, be removed with balls about their roots into other pots, and replunged in the hot-bed. When they have had some growth in this situation, they should be removed into a deep frame, being placed in a fresh hot-bed, to bring them up tall and handsome. Afterwards they should be often refreshed with water, and have air admitted freely as the former advances, till they are capable of bearing it without injury; when about August they may be set out during the daytime, being protected in the night, and from wet weather. At this period they should be watered three or four times a week at least, in a rather sparing manner.

They afford a good effect when set out in the principal situations about the house, in assemblage with other plants of the potted kinds.

GOMRAPENDY, in *Geography*, a town of Hindoostan, in the Carnatic; 25 miles N. of Madras.

GOMS, one of the seven independent dixains or commonwealths of the Upper Vallais, in Switzerland; called *dixain*, because the Upper and Lower Vallais comprehend 10 districts, each being a dixain or tenth of the whole. Goms is situated at the foot of mount Grimel, and extends along the bank of the Rhone; and is so called from a town, 35 miles E. of Sion. See VALLAIS.

GOMUT, a river of Bengal, which runs into the Megna, near Chandpour.

GONU *Peperis*, a town of Hindoostan, in Dowlatabad, six miles N. of Amednagar.

GOMUTTRA SRAJITTA, in *Natural History*, the name given by the Indians to a kind of fossil, found in great plenty on the mount Vindy in the East Indies, in places, as they observe, where the cows frequently urinate. It is a bituminous substance, and after calcination the residue is given in cases of internal ulcers and in gonorrhoea. The Indians supposed it formed by the drying up of the cow's urine.

GONAGRA, composed of *gout*, *luna*, and *gout*, *caput*, *fizing*, in *Makins*, the gout in the knee. See GOUT.

GONAMBOUCH, in *Ornithology*. See ENBERIZA *Grifa*.

GONANPILLY, in *Geography*, a town of Hindoostan, in the circle of Ellore; 18 miles N. E. of Ellore.

GONAPI, one of the smaller Banda islands, in the centre of which is a volcano. The only inhabitants are wild dogs, cows and serpents. S. lat. 4° 10'. E. long. 130° 34'.

GONARCHA, a term in the ancient dialling. Mr. Perrault, in his notes on Vitruvius, lib. ix. cap. 9. takes the gonarcha to have been a dial drawn on divers surfaces or planes; some of which being horizontal, others vertical, oblique, &c. formed divers angles.

Whence the appellation, from *gon*, knee, or *gonion*, angle.

GONARY, in *Geography*, a town of Hindoostan, in the Myfore; 12 miles S. of Rydroog.

GONAVE, LA, an island situated on the west side of St. Domingo, about 14½ leagues in length, and about three in breadth. This is called Grand Gonave by way of distinction from Petit Gonave, another small island about two miles in each direction, separated from the S. E. corner of the former, by a channel three miles wide. Gonave is 13½ leagues W. by N. W. from Port au Prince. N. lat. 18° 51'. W. long. 73° 40'. See ST. DOMINGO.

GONAVES, a sea-port in the above-mentioned island, at the head of a bay of its own name, on the N. side of a bay of Leogane. The harbour is excellent; the town has a medicinal spring, and in 1772 both were erected with lodging-houses for the accommodation of those who resort to it, and an hospital for soldiers and sailors. It lies on the great road from Port de Paix to St. Mark, 16 leagues S. E. of the former. N. lat. 19° 22'. W. long. 73° 20'.

GONCANAMA, a town of S. America, in the audience of Quito; 20 miles S. W. of Loxa.

GONCELIN, a town of France, in the department of the Isere, and chief place of a canton, in the district of Grenoble; 13 miles N. N. W. of Grenoble. The place contains 1558, and the canton 10,259 inhabitants, on a territory of 197½ kilometres, in 14 communes.

GONDAR, the metropolis of Abyssinia, is situated upon a hill, elevated 8440 feet above the ocean, and consists of about 10,000 families in times of peace. The houses are chiefly constructed with clay, and the roofs are thatched in a conical form, which is the mode of building within the tropical rains. On the west end of the town is the king's house, formerly a structure of considerable importance; it was a square edifice, flanked with square towers; formerly four stories high, and the top of it afforded a magnificent view of the whole country S. of the lake Tzana. Although the greatest part has been burnt at different times, there is ample lodging in the two lowest floors of it; the audience chambers being above 120 feet long. Annexed to this ruined palace are apartments, constructed by succeeding kings, also of clay, according to the fashion of their own country; for the palace itself, says Bruce (*Travels*, vol. iii.) was built by masons from India in the time of Facilidas, and by such Abyssinians as had been instructed in architecture by the Jesuits, without embracing their religion, and afterwards remained in the country, unconnected with the expulsion of the Portuguese, during this prince's reign. The palace and its contiguous buildings are surrounded by a stone wall, 30 feet high, with battlements upon the outer wall, and a parapet roof between the outer and inner, by which you may pass along the whole and have a view of the street. There never appear to have been any embrasures for cannon; the four sides of this wall are above 1½ English mile in length. The mountain, on which the town is situated, is

encompassed on every side by a deep valley, which has three outlets; the one to the south, to Dembea, Maitshaw, and the Agows, the second to the N. W., towards Sennar over the high mountain Debra Tzai, or the mountain of the Sun, at the foot of which Koscam, the palace of the Iteghé, is situated, as are also the low countries of Walkayt and Wal-dubba; the third is to the N. to Woggora, over the high mountain Lamalmon, and so on through Tigré to the Red sea. The river Kabha, coming from the mountain of the Sun, runs through the valley, and covers all the south of the town; the Angrab, falling from Woggora, surrounds it on the N. N. E.: these rivers join at the bottom of the hill, about a quarter of a mile S. of the town. On an eminence opposite to Gondar, on the other side of the river, is a large town of Mahometans, consisting of about 1000 houses. They are all active and laborious, and are employed in taking care of the baggage and field-equipage of the king and nobility, when they take the field and return from it; but they never fight on either side. N. lat. 12° 34' 30". E. long. 37° 33'.

GONDEBAUD, in *Biography*, third king of the Burgundians, celebrated as a legislator among the barbarians over whom he reigned as sovereign. He obtained the crown in 491, and almost immediately, under pretence of assisting Odoacer against Theodoric, entered Italy, carrying fire and sword through Æmilia and Liguria, and made a great number of captives, many of whom he liberated without ransom, at the request of Epiphanius bishop of Pavia. He assembled, in 499, a council at Lyons, in order to effect a reconciliation between the Catholics and Arians. He was himself an Arian, from habit and education; but he was unable to effect so laudable a purpose. About this time he was attacked and defeated by Clovis king of the Franks; who made the Burgundian monarch his tributary. Clovis returned to his own country, and Gondebaud revenged himself upon his brother Godegisil, who had joined Clovis, surprised him, and put him to death. From this period he reigned in peace over his people, whom he rendered flourishing by the arts of civilization, and by a regular system of laws. These, says the historian, were in general founded on equity, and display much sagacity in preventing all causes of dispute; nevertheless, they enjoin the barbarism of judicial combats, which the legislator justified as an inference from the admitted doctrine of the interference of a particular providence in human affairs. The Burgundian code, called "La loi Gombrette," has been published in several collections of ancient laws. This prince died in 516, leaving behind him, as memorials, letters upon theological subjects to Avitus, bishop of Vienne. Univer. Hist.

GONDEGAMA, or GONDLACOMMA, in *Geography*, a river of Hindoostan, which forms the nominal boundary of the Carnatic, and discharges itself into the sea at Medipilly. Combam, or Commum, is near its source. It is sometimes called Gilligama, and Gunta-camina.

GONDICOTTA, a town of Hindoostan, in Marawar; 33 miles N. of Trumian.

GONDOLA, a little flat boat, very long and narrow, chiefly used at Venice to row on the canals.

The word is Italian, *gondola*. Du Cange derives it from the vulgar Greek *κωνδολα*, a bark, or little ship; Lancelot deduces it from *γωνδ*, a term in Athenæus for a sort of vase.

The middle-sized gondolas are upwards of thirty feet long, and four broad; they always terminate at each end in a very sharp point, which is raised perpendicularly to the full height of a man.

The address of the Venetian gondoliers, in passing along their narrow canals, is very remarkable; there are usually two to each gondola, and they row by pushing before them. The fore-man rests his oar on the left side of the gondola; the hind-man is placed on the stern, that he may see the head over the tilt or covering of the gondola, and rests his oar, which is very long, on the right side of the gondola.

GONDOLA is also the name of a passage-boat of six or eight oars, used in other parts of the coast of Italy.

GONDOLA-*shell*, in *Natural History*, a name given by authors to a peculiar kind of *concha globosa*, supposed, in some degree, to represent the shape of a Venetian boat. It is of the genus of the *dolium*, and there are seven species of it. See *DOLIUM* and *CONCHOLOGY*.

GONDOMAR, in *Geography*, a town of Spain, in Galicia; 6 miles E. of Bayona.

GONDRECOURT, a town of France, in the department of the Meuse, and chief place of a canton, in the district of Commercy. The place contains 1113, and the canton 8973 inhabitants, on a territory of 340 kilometres, in 24 communes.

GONDUFEE, a town of Africa, in the kingdom of Kong; 100 miles S. E. of Kong.

GONDWARAH, a town of Bengal; 15 miles S. S. W. of Purneah.

GONESSE, a town of France, in the department of the Seine and Oise, and chief place of a canton, in the district of Pontoise, nine miles N. of Paris. The place contains 2400, and the canton 14,811 inhabitants, on a territory of 182½ kilometres, in 22 communes.

GONET, JOHN BAPTIST, in *Biography*, was born at Beziers in the year 1616. He embraced the ecclesiastical life when he was young, and was admitted to the degree of doctor of divinity by the university of Bourdeaux in the year 1640. He was at the same time elected to the professorship of theology in that university, an office which he held with great dignity till the year 1671, when he was appointed provincial among the Dominican friars. In 1675 he resumed his labours as professor, which he continued about two years, and then retired to his native place, where he died in 1681. He was author of a system of divinity, entitled "Clypeus Theologiæ Thomisticæ, contra novos ejus impugnatores," first published at Bourdeaux in 1666, in eighteen volumes 12mo., but it was afterwards enlarged, and printed in five volumes folio. He was likewise author of a "Mannale Thomistarum, seu brevis Theologiæ Cursus," which has passed through different editions, of which the best was published at Lyons in 1681: and "Dissertatio Theologica de Probabilitate." Moreri.

GONFALON, or GONFANON, a kind of round tent, borne as a canopy, at the head of the processions of the principal churches at Rome, in case of rain; its verge or banner serving for a shelter, where there is not a great deal of attendance.

GONG, a Chinese metalline, musical instrument of percussion, in the form of a flat basin, with a ridge round it, and beaten by a mallet covered with several folds of woollen cloth. It is carried on a pole by two men, and beaten by the hindmost. In the march of an army, it is used as a military instrument to regulate the steps of the soldiers; when struck with great force, it is sufficiently loud to be heard at a mile's distance; but so confused is the sound, that no distinct tone can be ascertained. Yet by reiterated gentle strokes on the same part of the bottom of the basin a musical tone may be produced; but different parts of the circle produce tones of different gravity and acuteness.

It is used in processions, and at court on days of ceremony and festivals, in concert with other instruments, as the double drum. On the water, in vessels that are rowed, this instrument regulates the strokes of the oars.

It is formed of brass or bronze, and called *Lu* by the Chinese, who, from hearing it only on great occasions, regard it with reverence.

GONGA, in *Geography*, a town of European Turkey, in Romania, near the sea of Marmora; 36 miles N. E. of Gallipoli.

GONGA, or *Bain Gonga*, a river of Hindocion, which falls into the Godavery about 50 miles from the sea. See *BAIN GONGA*, and *GODAVERY*.

GONGACA, a town of Bengal; 30 miles S. W. of Calcutta.

GONGADEE, a town of Bengal; 50 miles S. W. of Rogonantpou.

GONGOLARA, in *Botany*, a name by which Imperatus has called a very beautiful sea plant, known among botanical writers by the name of *fucus erica folius*, or *erica marinis*, the sea heath.

GONGONG, is an instrument used by the Hottentots, and all the negroes on the western coast of Africa. Of this kind there are two sorts, the large gongong and the small. In the supplement to the first edition of the French Encyclopédie, a description of this instrument has been attempted, that seems totally unintelligible.

"The small gongon (say the editors) is an iron or holly bow, of which the string is the sinew of a sheep dried in the sun, or a bowel string; at the extremity of the bow is placed, on one side, the pipe of a split quill, in the hollow of which the string of the bow is lodged. The performer holds this quill in his mouth when he is playing, and the different tones of the gongon proceed from the different modulations of his breath.

"The great gongon only differs from the small by the shell of a cocoa-nut, of which the upper part has been cut off, and the string of the bow, before its tension, passed through it on each side. In touching the instrument the cocoa-shell is moved to and from the quill according to the tone which is to be produced."

We hope our readers will comprehend this description, by which we frankly own ourselves not to be much enlightened; nor can we well conceive how the motion of the split quill, or the section of the cocoa-nut, can produce different tones. Nothing that answers to this description is to be found on the plate referred to (fig. 3. Pl. II.) but in Pl. III. fig. 9. Mus. Init. there is, we think, a very unsatisfactory representation of it. And in the rude state in which the European arts in general have been found in such parts of Africa as have already been explored, we have little reason to lament our ignorance of the construction and use of the gongong.

GONGOO, in *Geography*, an island in the Red Abud or Guin river of Africa, in its course between Cassina or Kassina, and Mekzara. N. lat. 16. E. long. 11.

GONGOOPOUR, a town of Hindoostan, in Oude, 12 miles S. of Kairabad.

GONGORA, LEWIS, in *Biography*, a celebrated Spanish poet, was born at Cordova in 1562. He studied at Salamanca, and being brought up to the church, was made chaplain to the king, from whom he received considerable ecclesiastical preferment. He died at Cordova, of the cathedral of which he was prebend. His reputation is built on a volume of poems, under the title of "Obras de Don Lewis de Gongora-y-Argote," &c. The poems consist of a variety of compositions, chiefly of the licentious and satirical.

lyrical, in which style he so much excelled, as to be termed by his countrymen "the prince of lyric poets." Gongora possesses, in the estimation of his countrymen, a very high rank among the Spanish poets for an artificial elevation of language, and uncommon turn of thought, which were formerly the characteristic of the poetry of that nation. So much, indeed, did he surpass in these qualities, that he had many censurers in his own country, though he also met with as many warm defenders. He is said to have enriched his native language by the introduction of many Latin words happily employed. Moreiri.

GONGORONA, in *Surg. v.*, a hard tumour; but especially a Bronchocele, or swelling of the thyroid gland. The word is said to be derived from *gongos*, a round tubercle on the trunk of a tree.

GONHARY, in *Geography*, a town of Hindoostan, in Oude: 40 miles W. of Lucknow.

GONIA, a town of Asiatic Turkey, in Natolia; 16 miles W. of Aphion-Karabilar.

GONIAH, or KONG, supposed to be the *Conche* of D'Anville, and the *Gonye* of Delisle, a kingdom of Africa, situated to the N. of Guinea, between the meridian of Greenwich, and 5° W. long., and between the 10th and 12th degrees of N. lat. It is about 870 miles westward from Cahna or Kaffna, and between 530 and 620 miles from the Gold Coast. Some say, there is no communication between this coast and the country of Gonjah; the king of Affentoi, who possesses the intervening space, prohibiting his inland neighbours from passing through his country. Others report, that other states (*e. g.* the Fantees, and their confederates) lie between Affentoi and the sea; and that the Affentois have often unsuccessfully attempted to open a communication with the coast.—Also, the name of a town, which is the capital of the kingdom of Gonjah or Kong. N. lat. 11° 30'. W. long. 3° 30'.—Also, the name of part of a chain of mountains, extending from almost the mouth of the river Gambia, in the Atlantic, to Nigritia, towards Abyssinia.

GONIAH, a decayed town and large castle of Asiatic Turkey, belonging to the province of Guriel, at the mouth of a river which runs into the Black sea. It is garrisoned by a few Janissaries, and inhabited chiefly by seamen; 80 miles E.N.E. of Trebizond. N. lat. 41° 25'. E. long. 41° 10'.

GONJENPILLY, a town of Hindoostan, in the Carnatic; 18 miles N.E. of Nellore.

GONIOCARPUS, in *Botany*, so called from *gonion*, an angle, and *carpos*, fruit, expressive of one of its essential characters. The name, originally contrived by Thunberg, was *Gonocarpus*, which being incorrectly constructed, and too near *Conocarpus*, was judiciously changed by Mr. König, Schreber, Willdenow, and others, have made it *Gonioscarpus*, for want of attending to its meaning and application, which has no reference to *gonion*, *gonion* a *line*, but to the very peculiar angles of the fruit.—König in *Ann. of Bot.* v. 1. 546. t. 12. f. 5. 6. (*Gonocarpus*; Thunb. *Nov. Gen.* 55. Pl. Jap. 5. Murr. in *Linn. Syst. Veg.* ed. 14. 164. Juss. 442. Lamarek. *Illust.* t. 73. *Gonatocarpus*; Schreb. 86. Willd. *Sp. Pl.* v. 1. 690. Mart. *Mill. Dict.* v. 2. 3.)—Class and order, *Tetrandria Monogynia*. Nat. Ord. *Onagras*, or *Onagraceæ*, Juss. König.

Gen. Ch. *Cal.* Perianth superior, in four deep, acute, equal, upright segments. *Cil.* Petals four, equal, oblong, concave, inserted into the rim of the calyx, and twice as long as its teeth. *Stam.* Filaments four or eight, very short, inserted into the calyx, opposite to the petals if four, to the petals and only -teeth if eight; anthers oblong, large,

shorter than the corolla. *Pist.* Germen inferior, turbinate, with eight furrows and as many angles, crowned with the permanent calyx; style extremely short; stigmas four, obtuse, downy.

Ess. Ch. Calyx superior, in four deep equal segments. Petals four. Drupa dry, with eight angles. Nut solitary, of one cell.

Three species of this inconspicuous though curious genus are at present known.

1. *G. micranthus*. Thunb. *Jap.* 69. t. 15.—Leaves ovate, obtusely crenate, smooth, as well as the stem.—Gathered by Thunberg in Japan. *Root* fibrous, annual. *Stems* three or four inches high, ascending, quadrangular, smooth, leafy, simple below, panicled above. *Leaves* opposite, on short stalks, ovate, rather acute, half an inch long, bluntly crenate and cartilaginous in the margin, smooth on both sides; minutely dotted, furnished with a rib, but no veins; the upper ones gradually smaller and more entire. *Stipules* none. *Flowers* very small, purplish, drooping, in several slender, lax, upright spikes, forming a sort of panicle. The *petals* as well as *calyx* are sufficiently evident in Thunberg's own specimens before us. The *fruit* is no bigger than the smallest pin's head, and the petals scarcely longer.

2. *G. rotundifolius*.—Leaves rounded, somewhat heart-shaped, obtusely crenate, smooth. Angles of the stem rough. Spikes in a compound panicle.—Gathered near Port Jackson, New South Wales, by John White, M. D.—We are by no means certain that this is more than a variety of the former, but its different country, much more rounded leaves, heart-shaped at the base, and the brittle angles of the stem, induce us to propose it as a species. Possibly the panicled spikes may be owing to the greater luxuriance of the specimens. The *fructification* appears precisely like that of the first species.

3. *G. feaber*. König *Ann. of Bot.* v. 1. 547. t. 12. f. 6.—Leaves elliptic-lanceolate, sharply ferrated, bristly as well as the stem.—Gathered by Mr. David Nelson, in cultivated ground in the island of China, near Macao. This appears to differ from the two former very materially, being all over rough, with depressed bristles, and having longer and narrower sharply ferrated leaves. The *flowers*, moreover, have eight stamens, and the angles of the *fruit* are wavy or crisped, not smooth and even.

We have a plant gathered by Dr. White, near Port Jackson, which seems to answer in every point to Mr. König's description and figure of the last, except that its petals have a bristly keel, and the stigmas are singularly branched and plumose, making a large tuft in the centre of each flower after the petals are fallen. Perhaps Mr. König's specimens had lost all their stigmas. We remark, however, a further difference in the fruit, whose alternate angles are less distinct, or rather more crisped and interrupted than the rest. Not having examined authentic specimens of *G. feaber*, we must leave this matter in doubt.—Possibly this may be *G. tinogynus*. Billard. *Nov. Holl.* t. 53.

GONIOMETER, an instrument used for the purpose of measuring solid angles (particularly of crystals), or the inclination which one plane surface makes with another. The small goniometers, as usually sold at the shops, are of a construction so simple, as to require but little description. They generally consist of a small pair of compasses or nippers, destined to receive the angle of the crystal; and the legs of these being continued in the opposite direction, beyond the angular point or joint, the angle is measured by applying them to a protractor or semicircular scale of degrees.

But notwithstanding much ingenuity has been bestowed on instruments constructed on this principle, none of them have



## GONIOMETER.

have been found nearly accurate enough for the purpose, for which they are required, many interesting questions in the modern science of crystallography requiring a much more exact determination of the angle than can possibly be obtained by instruments of this construction.

We are indebted to Dr. Wollaston for having removed all these difficulties, by the invention of an instrument which accomplishes all that the most scrupulous naturalist can possibly desire. The principle of this invention is entirely optical, and (*Plate XIX. Miscellany, fig. 2.*) represents the instrument as made and sold by Mr. Carey, in the Strand; but the reader, when acquainted with the nature of it, will readily see that any person possessed of a graduated instrument, such as a theodolite, transit, &c. may, without great difficulty, apply it to the measurement of angles, though in a much less commodious manner than on an instrument made expressly for the purpose.

Dr. Wollaston's method consists in employing a ray of light reflected from the surface, instead of the surface itself; and thus, for a radius of 1-50th of an inch, we may substitute either the distance of the eye from the crystal, which would naturally be twelve or fifteen inches, or for greater accuracy we may, by a second mode, substitute the distance of objects seen at a hundred yards or more from us. The instrument described by Dr. Wollaston, in the *Transactions for 1809*, consists of a circle, *fig. 3*, graduated on its edge, and mounted on an horizontal axle supported by an upright pillar. This axle, being perforated, admits the passage of a smaller axle through it, to which any crystal of moderate size may be attached by a piece of wax, with its edge, or intersection of the surfaces, horizontal and parallel to the axis of motion. This position of the crystal is first adjusted, so that by turning the smaller axle, each of the two surfaces, whose inclination is to be measured, will reflect the same light to the eye. The circle is then set to zero, or 180, by an index attached to the pillar that supports it.

The small axle is then turned till the further surface reflects the light of the candle, or other definite object, to the eye; and lastly, (the eye being kept steadily in the same place,) the circle is turned by its larger axle, till the second surface reflects the same light. This second surface is thus ascertained to be in the same position as the former surface had been: the angle through which the circle has moved, is, in fact, the supplement to the inclination of the surfaces; but as the graduations on its margin are numbered accordingly in the inverted order, the angle is correctly shewn by the index, without requiring any computation.

It may be here observed, that it is by no means necessary to have a clean uniform fracture for this application of the instrument to the structure of laminated substances; for since all those small portions of a shattered surface that are parallel to one another, (though not in the same plane,) glisten at once with the same light, the angle of an irregular surface may be determined nearly as well as when the reflecting surfaces are actually in the same plane. In this method of taking the measure of an angle, when the eye and candle are only ten or twelve inches distant, a small error may arise from parallax, if the intersection of the planes or edge of the crystal be not accurately in a line with the axis of motion. But such an error may be rendered insensible, even in that mode of using the instrument, by due care in placing the crystal; and when the surfaces are sufficiently smooth to reflect a distinct image of objects, all errors from the same source may be entirely obviated by another mode of using it.

For this purpose, if the eye be brought within an inch

of the reflecting surface, the reflected image of some distant chimney may be seen inverted beneath its true place, and, by turning the small axis, may be brought to correspond apparently with the bottom of the house, or some other distant horizontal line. In this position the surface accurately bisects the angle which the height of that house subtends at the eye, or rather at the reflecting surface; then, by turning the whole circle and crystal together, the other surface, however small, may be brought exactly into the same position; and the angle of the surfaces may then be measured, with a degree of precision that has not hitherto been expected in goniometry.

The accuracy, indeed, of this instrument is such, that a circle of moderate dimensions, with a vernier adapted to it, will probably afford corrections to many former observations. Dr. Wollaston has remarked one instance of a mistake that prevails, respecting the common carbonate of lime, which he mentions, because this substance is very likely to be employed as a test of the correctness of such a goniometer, by any one who is not convinced of its accuracy, from a distinct conception of the principles of its construction.

The inclination of the surfaces of a primitive crystal of carbonate of lime, is stated with great appearance of precision to be 104° 28' 40"; a result deduced from the supposed position of its axis, at an angle of 45°, with each of the surfaces, and from other seducing circumstances of apparent harmony by simple ratios.

But however strong the presumption might be, that this angle, which by measurement approached to 45°, is actually so, it will nevertheless be, in fact, about 45° 20'; for the inclination of the surfaces to each other is found to be very nearly, if not accurately, 125°, as it was formerly determined to be by Huygens; and since the measure of the superficial angle, given by Sir Isaac Newton, corresponds with this determination of Huygens, his evidence may be considered as a further confirmation of the same result; for it may be presumed, that he would not adopt the measures of others without a careful examination.

### *Explanation of the Figure.*

*a b*, Is the principal circle of the goniometer, graduated on its edge.

*c c*, The axle of the circle.

*d*, A milled head, by which the circle is turned.

*e e*, The small axle for turning the crystal, without moving the circle.

*f*, A milled head on the small axle.

*g*, A brass plate supported by the pillar, and graduated as a vernier to every five minutes.

*h*, The extremity of a small spring, by which the circle is stopped at 180, without the trouble of reading off.

*i i* and *k k*, Are two centres of motion, the one horizontal, the other vertical, for adjusting the position of a crystal; one turned by the handle *l*, the other by the milled head *m*.

The crystal being attached to a screw head at the point *n*, in the centre of all the motions, with one of its surfaces, as nearly parallel as may be to the milled head *m*, is next rendered truly parallel to the axis, by turning the handle *l* till the reflected image of a horizontal line is seen to be truly horizontal. By means of the milled head *f*, the second surface is then brought into the position of the first, and if the reflected image from this surface is found not to be horizontal, it is rendered so by turning the milled head *m*, and since this motion is parallel to the first surface, it does not derange the preceding adjustment.

**CONIOMETRICAL LINES**, derived from *γωνία*, *angle*, and *μέτρον*, *measure*, in *Geometry*, lines used for measuring or determining the quantity of angles. Such are lines, tangents, secants, versed lines, &c.

We have a paper by Mr. Jones, in the *Philosophical Transactions*, containing a commodious disposition of equations for exhibiting the relations of coniommetrical lines, from whence a multitude of curious theorems may be derived. See *Phil. Trans.* N<sup>o</sup>. 483. sect. 26.

**CONIUM**, in *Zoology*, a genus of *Vermes*, characterized only by their very simple, flat, and angular form, and being invisible to the naked eye. The species at present known are few, amounting to no more than five in number; and for the existence of these we rely chiefly on the microscopical researches of Müller and Schrank, the former of whom describes four of these minute creatures with great accuracy in his "*Zoologia Danica*." They are mostly inhabitants of fresh or pure water, though some of them occur in stagnant water or in dunghills.

#### Species.

**POLYSPIERIUM**. Orbicular, pellucid, with innumerable spherical molecules. Schrank.

Found in stagnant water; the colour greenish-yellow, and general appearance that of a thin membrane filled with innumerable lucid globules. Very common in the month of July.

**PECTORALE**. Quadrangular, pellucid, with sixteen spherical molecules. Müll. Goeze, &c.

The molecules are oval and nearly of an equal size, their colour greenish, pellucid, and disposed in a quadrangular manner within the membrane, like diamonds in a ring; or rather, as Müller compares them, to the jewels in the breast-plate of the high priest among the Jews, and reflecting light on both sides. Its progress is by an advancement alternately towards the right and left, at which time all the molecules are in motion, and assume their oval form, these molecules being round when the animal is in a quiescent state.

**TRUNCATUM**. Angles obtuse; posterior part arched. Müll.

This occurs in fresh or pure water, and is rarely met with; its size is rather considerable; the fore-part is a straight line, the sides forming therewith obtuse angles, the extremity of the sides being united by a curved line; the internal organs, perceptible to the eye by the assistance of the microscope, consist of a number of molecules of a dark green colour, and two vesicles of peculiar brightness in the middle. Its motion is languid.

**LEVIATUM**. Rectangular, the posterior part arched. Müll. Gmel. *G. Rectangulum*, Adams.

The projection at the base of the body in this species is placed in a right angle; the intestines green, with the larger vesicle transparent.

**PELVINATUM**. Quadrangular, opaque, with four cylindrical protuberances. Müller.

This species, according to Müller, appears under a slight magnifier like a quadrangular membrane, plain on both sides, but, when a deeper lens is applied, resembles the figure of a bolster, formed of three or four cylindrical pillows, flattened or sunk in various places: this was the appearance it assumed when first examined; some days after all the sides were plain without convexity and decussated, or divided into little squares by the intersection of straight lines. It is found in puddles under dunghills.

**GONKEER**, in *Geography*, a town of Chinese Tartary. N. lat. 44 50'. E. long. 117 51'.

**GONKOFEN**, or **GANKOFEN**, a town of Bavaria; 14 miles E. of Landshut.

**GONNA**, a town of Hindoostan, in Lahore; 12 miles W. of Nurgorcote.

**GONNI**, or **GONNO**, in *Ancient Geography*, a town of Greece, in the Perrhebia, situated near Paleus, towards the strait where the Olympus and Offa approached each other.

**GONNOCONDYLUM**, a town of Greece, in Macedonia, in the Perrhebia.

**GONOESSA**, a town of Greece, in the Peloponnesus. In the time of Pausanias it belonged to the Sicyonians.

**GONOLOBUS**, in *Botany*, from *γωνία*, *an angle*, and *λοβός*, *a pod*, alluding to the angles or ribs of the fruit. Michaux *Boreali-Amer.* v. 1. 119. Brown *Afcep.* 24.—Class and order, *Pentandria Digynia*. Nat. Ord. *Contortia*. Linn. *Apocinea*, Juss. *Ajelpiadea*, Brown.

Gen. Ch. Cal. Perianth inferior, of one leaf, in five deep, acute, spreading segments, permanent. Cor. of one petal, wheel-shaped, in five deep spreading segments. Necessary like a shield, crowning the stamens, lobed. Stam. Filaments five, thickish, united into a short tube; anthers curling transversely, terminated by a membrane, their masses of pollen attached to the outer extremity, with respect to the cell, and covered by the stigma. Pist. Germens two, ovate-oblong; styles two, very short, close together; stigma common to both, flattish and depressed, with five angles. Peric. Pouches inflated, more or less angular or ribbed. Seeds numerous, imbricated, oblong, crowned with down.

Eff. Ch. Corolla wheel-shaped, in five deep segments. Nectary a lobed shield-like crown. Anthers curling transversely, terminated by a membrane. Stigma five-angled, depressed. Pouches inflated, ribbed. Seeds with a hairy crown.

This appears to be a numerous genus, properly separated from *Cynanchum*, and consisting of climbing shrubs, with opposite broadish leaves, and flowers growing in umbels between the insertion of the foot-stalks. They are natives of America, chiefly within the tropics. Examples of it are *Cynanchum maritimum*, Linn. Mant. 54. Jacq. *Amer.* 83. t. 56, a hairy plant, with dark-purple blossoms: *suberosum*, Linn. Sp. Pl. 310, figured in Dill. Hort. Elth. t. 229. f. 296, likewise a downy species, with purplish-green flowers; and *crispiflorum*, Ait. Hort. Kew. v. 1. 302. Plum. Ic. t. 216. f. 1: as well as many others presumed to have the same generic characters, but which, according to Mr. Brown, require to be thoroughly examined, as does the whole genus.—Michaux enumerates three species, natives of the warmer parts of North America, and which he calls *G. macrophyllum*, *hirsutum*, and *levis*.

**GONON BESAR**, in *Geography*, a mountain on the E. side of the island of Java, famous for the quantity of pepper which its trees produce.

**GONONG**, or **GANAPEZ**, one of the group of Asiatic isles, called *Banda*, in which there is a remarkable volcano.

**GONOR**, a town of Hindoostan, in the circle of Gohud.

**GONORHYNCHUS**, in *Ichthyology*, a species of *Cyprinus*, which see.

**GONORRHŒA** denotes, in *Surgery*, a disease in which a kind of matter, which is either actually pus, or a fluid of very similar qualities, is discharged from the urethra of the male subject, and from the surfaces of the labia, nymphæ, clitoris, and vagina of the female, attended with more or less heat, pain, and difficulty in making water. The discharge is infectious, and capable of communicating the complaint from one person to another, whenever it comes

## GONORRHOEA.

into contact with any of those surfaces, which are susceptible of contamination by it, and which, we believe, must be such as are naturally destined to secrete mucus. On the foregoing account, the disorder is almost always caught, or communicated, in the venereal connection, when some of the discharge of the diseased person is applied to the parts, which are liable to be affected in the healthy one. However, a gonorrhœa may be produced in any manner, which brings the infectious discharge into contact with the mouth of the urethra, the surfaces of the labia, &c. In the article OPHTHALMY, we shall have occasion to notice a particular inflammation of the eyes, attended with a copious discharge of matter from beneath the eye-lids, which is represented, by surgical writers, as originating from the inadvertent application of gonorrhœal matter to the eye-lids, the inner surfaces of which are well known to be mucous ones.

The Hunterian doctrines go so far as to assert, on the authority of experiments, that the poison of the lues venerea, and that of gonorrhœa, are in fact the same, though usually productive of opposite effects, by reason of the parts affected in a chancre, and those concerned in gonorrhœa having quite different structures. These things, if true, tend to prove, that the matter of a clap may, under certain circumstances, impart the venereal disease to the constitution. However, it should be understood, that the statement just now made can only refer to the gonorrhœa *virulenta*; for it is certain, that a simple discharge from the urethra, and a scalding sensation in making water, which would constitute a gonorrhœa, may be the consequence of any thing which produces mere irritation in the passage without the possibility of the venereal or common gonorrhœal virus being at all concerned. Thus, a man may have a stricture, and begin the employment of bougies for its cure; their irritation may bring on a foreswell in the urethra, and excite a discharge. Here we have an instance of the complaint arising from the operation of no virus whatever; but altogether from the unequivocal, mechanical, irritation of the bougies. Doubtless, also, there are sometimes discharges both from the male and female parts of generation, which, when applied to other persons, are capable of bringing on certain kinds of gonorrhœa by the entire effect of their irritation. So were a man, with a gonorrhœa, excited by the irritation of bougies to have connection with a woman, there is no doubt that the latter would be very likely to become troubled with a discharge and scalding in making water, merely in consequence of the application of some of the matter from the male urethra to the surfaces of the labiæ, nymphæ, &c.

The arguments which have been adduced to show that the poison of one form of gonorrhœa, and that of the venereal disease are the same, will more properly come under consideration hereafter. In the meanwhile, it is our part to enter a little more particularly into the history of gonorrhœa.

The etymological meaning of *gonorrhœa* is a running of the semen, the term being derived from *γενναι*, signifying the feminal fluid, and *ρρηναι*, to flow. The ancients are said to have entertained the very erroneous notion that the disease consisted of an oozing of the semen in a morbid and altered state. As it is long since so absurd a supposition has had any partisans, a refutation becomes superfluous, and every one now knows, that in the present, as in many other examples, truth and etymology are not coupled together. Dr. Swediaur, who has found fault with the term *gonorrhœa*, as conveying an untrue idea, has not been happy in a substitute

He remarks, that if a Greek name is to be retained, he would call the complaint *bleunorrhœgia*, from *βλεν*, mucus, and *ρρηναι*, to flow. Now this last expression is objectionable, on the identical principle which makes Dr. Swediaur wish for the relinquishment of gonorrhœa; for it is generally thought by all the most eminent modern surgeons, that the discharge is pus, and not mucus. Besides, we do not see much utility in abandoning the ancient appellation. The knowledge of surgery is now so highly cultivated, that there is not the least danger of any man imbibing an absurd opinion respecting this common complaint, from the etymological import of its name. Every juvenile apprentice know that a clap is a running of matter from the urethra. Few common practitioners trouble themselves about Greek derivations; and where is the object of changing the name of one disease, while many hundred other surgical terms stand in equal, and often greater, need of alteration?

The first perceptible symptom of a gonorrhœa is generally a kind of itching about the orifice of the urethra, attended with a slight swelling of its edges, and sometimes extending over the whole of the glans penis. Very shortly afterwards, the running commences, and the itching sensation changes into pain, which is severely felt at the time of making water. In some few instances, no considerable pain is experienced, till a long while after the access of the discharge and other symptoms. It is said that there are certain cases which are attended with no pain whatsoever, while other instances occur, in which patients suffer severely, even before the discharge makes its appearance.

When the inflammatory symptoms have come on, the penis seems swollen, and as if it were in a state of half-erection. The glans appears red, smooth, and enlarged, with a kind of transparency about it. Sometimes it is affected with a slight excoriation, which makes it exceedingly tender, and is the source of some trivial quantity of matter. The canal of the urethra becomes narrower than natural, if we may form a judgment from the diminution which takes place in the stream of urine. Indeed, very frequently, this fluid can only be discharged in a broken scattered current, or by drops. We have often seen severe retentions of urine attendant on the inflammatory stage of a gonorrhœa.

Small tumours may frequently be noticed along the inferior surface of the penis, in the course of the urethra. These swellings have been considered as the mucous gland of that canal in a swollen state. Sometimes they acquire a very large size, and ultimately suppurate and form abscesses, which, in some instances, burst externally, while, in others, they break into the urethra itself. In the latter event, the swelling all on a sudden subsides, as soon as the contained matter has escaped. Sometimes, after a certain interval, the tumour is seen to re-appear, which circumstance is said to be owing to a premature closure of the opening. Abscesses of the preceding kind are often met with in the situation of Cowper's glands. Here they also sometimes burst outwardly, sometimes inwardly, sometimes in both ways in the same patient. In this last case a new passage is made for the urine, termed a fistula in perineo. See FISTULA.

A painful sensation is frequently felt by the patient along the lower surface of the penis, extending as far as the anus, and depending on the inflamed state of the urethra. In most cases the erections are frequent, and generally productive of infinite pain, particularly when a foreswell exists along the track of the urethra towards the anus, or when the complaint is complicated with chordee. See CHORDEE.

The viscid transparent fluid which is naturally secreted by the glands of the urethra changes into a whitish aqueous liquor.

## GONORRŒA.

liquor, and the secretion which takes place from the lining of this canal, and is intended for its lubrication, also becomes less transparent. At length both these fluids, becoming thicker and thicker, gradually assume more and more the qualities of pus. The discharge often undergoes an alteration in its colour and consistence, a circumstance which Mr. Hunter imputed to the disposition of the parts by which the matter is formed. Sometimes it is white, sometimes yellow, sometimes of a greenish colour. Such varieties depend upon the diminution, or increase of the inflammation, and not upon the poisonous quality of the matter; for the same appearances happen whenever the parts are irritated in a certain degree by any cause whatsoever, as several facts confirm. Dr. Swediaur injected into his urethra some caustic volatile alkali mixed with water, by way of experiment. The usual symptoms of a gonorrhœa ensued, together with a discharge which had the same appearances and alterations of colour, as the matter of the gonorrhœa virulenta. We have already stated that the same circumstances most frequently attend the employment of bougies.

In the generality of instances, the discharge does not proceed from any great extent of the urethra, not from more than an inch, or an inch and a half of that part of the passage, which is nearest the orifice in the glans penis. This distance was what Mr. Hunter used to name the specific extent of the inflammation. Before this celebrated surgeon flourished, it was commonly supposed, that the matter came from the whole of the urethra, and even from Cowper's glands, the prostate, and the vesiculae seminales. Due attention to the symptoms, however, makes this idea seem quite improbable. If, for example, every part of the urethra, beyond the bulb, or if the bulb itself contributed to the discharge, the matter would be propelled out of the passage in the same manner as the semen, that is to say, by a sudden convulsive kind of action. It is well known that nothing can lodge in the bulb of the urethra, without immediately putting that part of the canal into action, particularly when in a state of irritation and inflammation. A drop of urine is not allowed to remain there, and if simple warm water be injected thus far, it is instantly forced out by the action of the acceleratores urine musculæ. Therefore it seems rational to conclude, that if the membranous and bulbous parts of the urethra, Cowper's glands, the prostate, and the vesiculae seminales, all had a share in forming the matter, no sooner would a certain quantity have collected in the bulb, than an immediate expulsion would be occasioned by the muscles of the part. No symptom of this kind, however, is usually observed, although it occasionally happens, that the acceleratores urine are affected with spasmodic contractions, which are particularly disposed to occur just after the patient has been making water, and do not seem to have any dependance on the discharge.

Mr. Hunter has taken notice that when the inflammation is violent, some of the vessels of the urethra often give way. Hence a hemorrhage arises, which is most profuse, just after the patient makes water, though it also continues at other times. Sometimes the blood is inconsiderable in quantity, and only just sufficient to give a red colour to the matter. The erections, which are so frequent in this complaint, are apt to occasion an extravasation of blood, a symptom which is always attended with an increase of the pain felt at the time of making water; but the bleeding always in the end lessens the inflammation, and tends to the relief of the patient.

The inflammation, accompanying a gonorrhœa, is attended with several of the characters of common inflammation;

but yet it differs also from the latter affection in many respects. It does not excite any pulsatory sensation; it causes little pain, except what arises from the irritation of the urine and the tension of the parts; and the inflammatory irritation seldom extends beyond the affected surfaces. The reason of so large a quantity of pus being secreted, in consequence of so moderate an inflammation, has been attributed to the parts being such as naturally secrete, so that they readily alter the natural into a morbid secretion.

Although the inflammation of a gonorrhœa is commonly moderate, there are instances in which it is exceedingly severe, and extends into the reticular texture of the surrounding corpus spongiosum urethricæ, particularly of that which is near the glans penis. Sometimes the inflammation advances further along the corpus spongiosum, and occasions a swelling, or extravasation of coagulating lymph, which is the cause of chloridæ. We have already stated that the inflammation occasionally gives rise to abscesses of the glands of the urethra, particularly of those in the perineum.

It is not decidedly known in what manner the disease communicates itself to the urethra. Some suppose that the inflammation creeps from the glans penis to the edges of the orifice of the urethra, and thence further into the passage. These reasoners will not allow the probability of a common opinion, that some of the infectious matter gets into the urethra at the time of coition. At all events it seems clear, that none of the contaminating fluid can get as far as the disease extends in ordinary instances, much less in others, where the affection reaches a great way towards the bladder. There are some facts which tend to prove that the simple application of the infectious matter to the end of the penis may give rise to a gonorrhœa. A case related by Mr. Hunter in his treatise on the venereal disease, seems to confirm the truth of what we have mentioned.

As we have already observed, the complaint seldom extends further along the urethra, than about an inch and a half, or two inches. Mr. Hunter thought, that this part of the canal appeared to be most susceptible of the particular kind of inflammation brought on by the infection, and it constituted, what he used to term, the specific distance of the disorder. However, neither the sensations of which the patient complains, nor the irritation of the parts, are confined to the real seat of the disease. The neighbouring parts are often affected with a variety of symptoms, of a nature more or less severe, such as uneasiness, and even pains every where about the pubes, scrotum, perineum, anus, and hips. It is often necessary to suspend the testicles, which become so irritable, that the least accident, or exertion, which, in other circumstances, would have no effect, makes them swell. It frequently happens that the glands in the groin are sympathetically affected; they swell and inflame, though they do not commonly suppurate. Cases also occur in which the irritation extends to the buttocks, thighs, and abdominal muscles, occasioning acute pain, swelling, and extreme soreness of the parts, and putting the patient under the necessity of always continuing in an horizontal posture. These symptoms, however, are not strictly inflammatory: if the patient be bled, his blood does not exhibit the inflammatory crust, and the constitution is little or not at all affected.

When the case, independently of the affections arising from sympathy, is not more violent than what has been described, it is called a common gonorrhœa; but the violence of the essential symptoms of the disease will be more or less considerable, according as the patient is more or less susceptible of such complaints as depend upon irritation. Thus, in particular habits, the inflammation does not con-

fine itself to the specific distance, but reaches all along the urethra. Severe pain is also frequently experienced in the perinæum. Sometimes the acceleratores urine muscels are affected [with the spasmodic contractions, of which some mention has already been made. Such spasm is particularly apt to come on when the patient has just finished making water; it shews itself by the manner in which the last drops of urine are expelled; and it is generally attended with contractions of the erectores muscels. Sometimes the inflammation is so great as to occasion a swelling, and even an abscess in the cellular membrane. It has already been observed, that the most common situation of such suppuration is in Cowper's glands; but the small glands of the bulb may also be affected in a similar manner, and the irritation, in certain instances, is found to extend even to the bladder itself.

When the latter organ is once affected, it becomes more susceptible of every kind of irritation, so that very distressing complaints are apt to be produced. It is no longer capable of bearing the degree of distention of which it is capable in the healthy state. Hence the patient cannot hold his water in the usual way; but no sooner does the inclination to discharge it arise, than he is immediately compelled to make the evacuation, notwithstanding the severe pain, which, while the urine is escaping, is felt in the bladder, and especially about the glans penis. This pain has been compared with what is experienced in a fit of the stone, and it lasts for some time after the evacuation is completed.

The ureters, and even the kidneys, are sometimes sympathetically affected, when the bladder is considerably inflamed or irritated. Such an occurrence, however, is exceedingly uncommon. Mr. Hunter mentions his having seen an inflammation of the peritonæum brought on by a severe affection of the bladder in gonorrhœa; and others have observed a violent inflammation of the kidneys from the same cause. (See *Encyclopédie Méthodique partie Chirurgicale*, tom. 1. p. 584.) It has already been mentioned that a chordee is one of the occasional effects of a gonorrhœa. It arises in general from inflammation; but in some cases it appears to be entirely of a spasmodic nature.

When the inflammation is not confined to the urethra and its glands, but spreads further, it attacks the substance of the corpus spongiosum, where it occasions an extravasation of coagulating lymph, which, uniting the cells together, makes the urethra incapable of yielding and being stretched in the same degree as the corpora cavernosa. Hence, during an erection, the penis becomes bent forward. The adhesion of the cells of the corpus spongiosum urethræ together, which is the cause of chordee, in general, comes on in consequence of mere inflammation of the canal; but occasionally it is the effect of a species of inflammation, which is seen accompanying certain ill-conditioned chancres. A chordee often continues after all the other symptoms of a gonorrhœa have quite ceased.

A chordee is sometimes altogether spasmodic, in which case it is seen to disappear and re-appear alternately, at indeterminate intervals. At one time the erections, which are so common in cases of gonorrhœa, happen without being attended with any curvature of the part; while at other periods the chordee takes place in a great degree; the intervals of time between these changes being sometimes remarkably short.

A swelling of the testicles is a frequent consequence of a gonorrhœa. It may happen in any stage of the disease; but, perhaps, it takes place most frequently when the complaint is on the decline. It was considered by Mr. Hunter as an affection arising from sympathy. It is seen attending

any kind of irritation in the urethra, whether occasioned by injections, bougies, or any other circumstance. In many cases, the swelling comes on and disappears very suddenly, or seems to leave one testicle to attack the other.

The swelling of the testicle generally begins with a soft, pulpy tumefaction of its glandular part, which becomes rather painful when handled. The tumour afterwards increases in size and firmness, and produces considerable pain. The inflammation seldom ends in suppuration, though some instances of this kind are met with. The epididymis (especially its lower end) is usually the hardest part; but, frequently, the induration and swelling attack the whole of the epididymis, and form a sort of knob at its upper part. The spermatic chord also is often affected, especially the vas deferens, which is thickened, and exceedingly tender. Sometimes the veins of the testicles are varicose.

The inflammation of the testicle, as well as that of the urethra, is frequently attended with sympathetic symptoms of irritation in other parts; for instance, pain at the lower end of the spine, a sense of weakness in the loins, colic pains, nausea, flatulence, disorder of the digestive organs, &c.

The swelling of the testicle is noticed to take place remarkably often just when the pain in the urethra has subsided, and the discharge has stopped; or else the truth is, that on the testicle becoming affected, the symptoms of irritation in the urethra immediately cease. Here it is somewhat difficult to determine which is the cause, and which the effect. However, it is worthy of remark, that it is not uncommon for the testicle to begin to swell at the very moment when the inflammation of the urethra, and the discharge, are becoming worse. Sometimes the epididymis alone is affected; sometimes only the vas deferens; and, on other occasions, only the spermatic chord. No reason can be assigned, why one of these parts should be affected rather than the rest. The inflammation of these organs is frequently attended with a strangury, especially when the discharge is suppressed; and, indeed, it is remarked, that the stoppage of the running generally brings on a tendency of that distressing complaint.

Another occasional effect of a gonorrhœa is a swelling of the lymphatic glands in the groin, a symptom, which is of the same nature as the inflammation of the testicle, but much more common. It has been supposed that the tumefaction of the glands depends on the absorption of some of the matter from the urethra; but Mr. Hunter contended against this opinion. He thought that, in gonorrhœa, the matter was seldom absorbed, and he derived this sentiment partly from seeing that a lues venerea was seldom the consequence of this disease. However, this argument will have no weight with those practitioners, who disbelieve in the doctrine that the poisons of gonorrhœa and the venereal disease are of the same nature. Another consideration, which influenced Mr. Hunter, will meet with more general approbation. It was the fact, that any simple mechanical irritation of irritable organs is capable of exciting an inflammation of their absorbents, and of the glands to which such vessels run. Now, since the lymphatics and their glands usually inflame before suppuration has taken place in the part originally affected, and their inflammation often subsides as soon as this last occurrence begins, we must conclude, that the swelling of the inguinal glands, in gonorrhœa, arises altogether from the irritation in the urethra. It is observed also, that such swellings almost always admit of resolution, while those which originate from the absorption of venereal matter from chancres very frequently suppurate, burst, and run into syphilitic ulcers. It is true, however, that swellings of the inguinal glands, induced by the irritation of gonorrhœa,

do sometimes end in abscesses and sores; but no lues venerea follows, nor is mercury requisite for the cure.

Another sympathetic affection, sometimes attendant on a clap, is a swelling of the absorbent vessels themselves. In some instances, this symptom accompanies the swelling of the glands. It makes its appearance in the form of a hard, painful cord, which, proceeding from the prepuce, extends along the dorsum of the penis, sometimes as far as the groins. This effect is not the consequence of the absorption of matter; for it is seen attending other irritations in the urethra, where no suspicion of any irritating or poisonous matter being taken up by the lymphatics can be entertained by any kind of reasoning whatsoever. The symptom is sometimes brought on by the employment of bougies, in the treatment of strictures. It was for a long while supposed, that the matter which is discharged from the urethra, in cases of gonorrhœa, was furnished from ulcers in this canal; but observation at length detected, that the opinion was destitute of all foundation. Dr. William Hunter is reputed to have been the first who asserted, that in gonorrhœa no ulcers existed in the urethra, and he is said to have begun to inculcate the fact in his lectures about the year 1750. This celebrated physician had derived his sentiment from some particular case; which he had seen, where a large quantity of pus had been formed upon the surface of the viscera, without any ulceration of these parts whatsoever. In 1753, his brother, Mr. John Hunter, had an opportunity of dissecting the bodies of two malefactors, who were executed, while it was known that they were affected with a severe gonorrhœa. After a most careful examination, no ulceration could be discovered: the urethra of each was merely found to be rather redder than natural, particularly near the glans penis. Mr. Hunter afterwards opened the urethra of many patients who had died with gonorrhœa upon them, and he never could find any vestiges of ulceration. It constantly appeared, that the membranous lining of the canal, near the glans penis, was redder than usual, and that the lacunæ were frequently filled with pus. Morgagni is said to have remarked the same fact. (*De Sedibus et Causis Morborum. Epist. 44. § 7.*)

As an attempt has been made by a late writer, Dr. Swediaur, to transfer the honour of the discovery from the Hunters to Morgagni, we deem it our duty to observe, that we cannot discover any accuracy, or justice, in the doctor's statement, since Morgagni's work was not published till 1761.

Although there can now remain no doubt, that in gonorrhœa there are no ulcers essentially, or commonly present in the urethra, to furnish the matter which is discharged, yet Mr. Hunter himself has explained, that a sore, occasioned by the bursting of an abscess in one of the glands of this passage, is sometimes produced. This kind of ulceration, however, never takes place till long after the commencement of the running, and it is quite of a different nature from such sores as were fancied to be the cause of gonorrhœa.

We shall now consider the identity of the gonorrhœa and venereal poisons. It has been represented by some surgical authors, that the essential difference between gonorrhœa and the venereal disease depends upon the circumstance of the first complaint being an affection of a secreting surface. Many other writers, and we may add, the generality of enlightened practitioners in this country, contend, that the two diseases originate from different poisons, a sentiment which is supported by the striking dissimilarity of the two affections, and the wide difference of their modes of cure.

Such authors, as maintain the doctrine of the two complaints being the consequence of different distinct poisons,

found their arguments upon various circumstances. First, the history of these diseases, and of their progress in different countries. Secondly, the phenomena peculiar to each disorder. Thirdly, the remedies necessary for the cure.

It is asserted, that the venereal disease and gonorrhœa did not make their appearance in Europe at the same period; but that the former was many years antecedent to the latter. The same thing is stated to have happened in other parts of the world, whither Europeans have conveyed the venereal virus. For instance, the venereal disease was known in China almost immediately after it had made its appearance in Europe; yet it is remarked by Astruc, that at the time when he wrote, gonorrhœa was a malady which had only been very recently observed among the Chinese. Also, in the South-sea islands, discovered in modern times, where both the venereal disease and gonorrhœa were unknown before the landing of European navigators, but where these maladies were afterwards diffused, gonorrhœa was not noticed till several years after syphilitic disorders had begun to shew themselves. Claps are said to have been yet unknown to the natives of the South-sea islands, at the period when captain Cook was performing his second voyage. (*Duncan's Medical Cases and Observations.*) All these circumstances have been adduced to prove the difference between that virus which gives rise to the venereal disease, and that from which gonorrhœa has its origin.

On the other hand, the circumstances attending the commencement of the venereal disease in these remote countries, led Mr. Hunter to draw a conclusion diametrically opposite to the one deduced by the foregoing class of reasoners; for, he observes, that it is almost impossible for a man to have a chancre during a voyage of several months, without the whole of the penis being destroyed, while it is well known, that a gonorrhœa may last an immense time, without losing the character of being virulent. It is related in the account of captain Cook's voyage, that the inhabitants of Otaheite, who were infected with the gonorrhœa, went up the country and got well; but that when the consequence of the malady was the venereal disease, the latter was incurable. Hence it is inferred, that the complaint which the Otaheiteans contracted was the gonorrhœa, since chancres and venereal affections would never have yielded to the simple means which were adopted. Besides, if the disorder had consisted of chancres, and the natives of Otaheite had been acquainted with the mode of curing such sores, it is contended, that they would likewise have understood how to cure other venereal symptoms. We find, also, from the perusal of captain Cook's third voyage, that the venereal disease afterwards raged in all its forms in the island of Otaheite. Now, since there is no document to shew, that the gonorrhœa was again introduced into that country, subsequently to Cook's second visit, it is concluded, that every form of the venereal disease which has been observed there has been derived from one source, which, in all probability, was a gonorrhœa.

Mr. Hunter mentions a gentleman who had a gonorrhœa thrice, of which he was cured without mercury. About two months after each infection, he had symptoms of lues venerea. The first were ulcers in the throat; the second were blotches on the skin; both which forms of the disease yielded to mercury. Thirdly, two punctures were made on the penis, with a lancet dipped in the matter of a gonorrhœa. One of these produced, on the part of the prepuce where it was made, a red, thickened speck, which increased and discharged some matter. This suppurated chancre healed on having its surface repeatedly destroyed by caustic. The other puncture was made on the glans, where it was followed



by a pimple, full of yellowish matter. This pimple was touched with caustic, and healed in the same way as the fore on the prepuce. Four months afterwards the chancre on the prepuce broke out again; then it healed, and returned. This it did several times; but always healed without any application to it. While the fores remained on the prepuce and glans, a bubo formed in the groin. A sufficient quantity of mercury was given to cure the gland locally, but not to prevent the constitution from being affected. Two months after the cure of the bubo, a venereal ulcer, according to Mr. Hunter, formed on one of the tonsils. This was cured by mercury; but the medicine was purposely left off as soon as the fore was skinned over, in order to see what parts would next be affected.

About three months afterwards, copper-coloured blotches made their appearance in the skin, and the ulcer on the tonsil recurred. This disease was again only palliated by mercury; but the complaints returned in the same situation as before; and were ultimately cured by a proper quantity of mercury.

On the other hand, doubts must exist, concerning this account of the matter of gonorrhœa, when the following circumstances are taken into consideration:

1st. It is impossible to say what time may elapse between the application of venereal poison to the penis, and the commencement of ulceration. Therefore, Bougainville's sailors, alluded to by Mr. Hunter, might have contracted the infection at Rio de la Plata; but actual ulcers on the penis might not have formed till about five months afterwards, when the ship arrived at Otaheite. 2dly. The second argument adduced by Mr. Hunter is certainly inconclusive. Every ulcer in the throat is not regularly venereal. A common ulcer may heal while the patient is using mercury. Hence the cure, apparently accomplished by this medicine, is no proof that the complaint was syphilitic. 3dly. The last fact of inoculation is undoubtedly very strong. But, though the insertion of gonorrhœal matter, or any other morbid matter, beneath the cuticle, will undoubtedly produce troublesome local complaints, may we not doubt that the fores, in the above case, were actually venereal ones? Can we implicitly depend on the continuance of the subject of the above remarkable experiments, during the long space of four months, between the healing of the fore on the prepuce, and its recurrence? If we cannot, the inference, in regard to the power of gonorrhœal matter to communicate the venereal disease remains unestablished. How much more conclusive in this respect, the experiments would have been, had the inoculation been practised on any other part but the penis. If the matter of gonorrhœa be capable of communicating the venereal disease, why does not the discharge commonly produce chancres on the glands and prepuce, with which parts it must lie in contact a very considerable time in every case? Why also does not the presence of a chancre frequently cause a gonorrhœa? If the infection of gonorrhœa, and the venereal disease, be really of the same identical nature, certainly, it seems very extraordinary, that the former complaint should receive no benefit from mercury, and the latter disease invariably require this specific remedy.

With respect to the venereal disease and gonorrhœa having arisen in Europe and elsewhere at different periods, it has been observed by such writers, as incline to the belief in the identity of the virus of the two affections, that every kind of contagious disease appears with greater violence in new-infected countries, than in other situations where it has been a considerable time endemial. In this manner, an endeavour, which, in our opinion, is quite unsuccessful, is made to ex-

plain the cause why the gonorrhœa generally did not make its appearance till a long while after the venereal disease had shewn itself in much worse shapes. The same class of reasoners also assert, that, notwithstanding the diligent enquiries of many able men, there is still a degree of doubt concerning the exact time when these diseases originated, and, of course, concerning the point, whether one of them actually existed a long while before the other. As we shall have occasion to treat of the origin of the venereal disease hereafter (see *LULS VENEREA*), we shall not enter into this disquisition in the present article. We may be permitted, however, to express our judgment, that discharges from the urethra must have been occasional discharges from time immemorial. Whether there be a species of gonorrhœa truly venereal, that is to say, one which depends upon the same virus, as syphilis, there may still be no doubt; but, that there are claps or discharges which arise from no poisonous or infectious matter whatever, but that they flow from mere irritation in the urethra, as, for example, of strictures, is certain and undisputed. These gonorrhœas must have prevailed as long as that could be traced to various kinds of irritation.

One argument adduced against the identity of the virus, is derived from the striking difference observed in the progress and symptoms of the two diseases. When the venereal disease is neglected, it always grows worse and worse, and sooner or later brings on the patient's dissolution. On the contrary, a gonorrhœa tends to a natural cure, and, though left to itself, commonly ends in a favourable way.

The advocates for the identity of the poison, however, contend, that, in order to account for this difference (which they state is not without exception), it is by no means necessary to suppose a different virus. They bring into consideration the circumstance of gonorrhœa depending upon an inflammation of the surface of the urethra, and not ulceration; and they maintain, that the absorption of the venereal poison generally happens much more easily from ulcerated surfaces, than from such as are simply inflamed. This mode of reasoning is brought forward as explanatory of the cause why, in the majority of cases, a gonorrhœa remains entirely a local complaint, and admits of a spontaneous cure, while the venereal disease is always prone to extend itself, and spread from one part of the body to another.

An argument against the identity of the virus is also founded on the reflection, that the venereal disease is also capable of communicating the venereal disease, and gonorrhœa of imparting gonorrhœa. The partisans of the doctrine which imputes this latter reflection to the venereal virus, acknowledge, that things do usually correspond with the statement just now given; but they assert that the contrary case is also frequently observed. They remark, that we may easily convince ourselves of this circumstance, by a fact which is well known to practitioners, namely, that when persons, who have a gonorrhœa, are not particularly careful to keep the glans and prepuce clean, chancres are very apt to form upon these parts, and by this means the whole system may become infected. It is also asserted, that, independently of the formation of chancres, there are cases proving, that the venereal disease is the consequence of a gonorrhœa, and that, as a consequence, the same practice must be used with instances of the kind. One of the most remarkable on record, is that related by Mr. Hunter; and it having been situated in the same cases as in the present article, we need not dwell upon it longer.

With respect to chancres arising from the matter of gonorrhœa being in contact with the glans and prepuce, we do, undoubtedly, believe, that both men and women are liable

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claps and chancres together; but, in our opinion, it is most rational to impute the fores to the application of venereal pus from chancres, together with the gonorrhœal matter, at the time of coition. We have no doubt that this act is often performed, when, between the two parties, both kinds of infection are present.

Certainly it seems extraordinary, that if the virus be of the same nature in both cases, the two effects should not always occur in the same patient. We ought naturally to expect, that when a gonorrhœa makes its appearance first, it would always be the cause of a chancre; and that when a chancre is the first symptom, it would invariably be the occasion of gonorrhœa. We dismiss from present consideration the assertion of such writers as defend the identity of the virus, that, in some few instances, one malady does become the cause of the other. Mr. Hunter suspected, that the irritation of one of the parts, forming the seats of the two diseases, became the preservative of the other. He thought, that when the urethra inflames and discharges matter, the adjacent external parts might, on that very account, be exempt from a disease which they would otherwise inevitably contract, by reason of the effect of the very virus which gave rise to the gonorrhœa. The same celebrated writer also entertained a suspicion, that when a chancre attacks the glans, or prepuce, the urethra might become insusceptible of the irritation, which, without the external disease, would certainly lead to a discharge from that canal.

This mode of explanation appears to us somewhat theoretical. We are of opinion, also, that in arguing in this way, the advocates for the identity of the virus only bring forward the shadow, instead of the substance of reason. In fact, they say nothing more than that supposed venereal matter cannot make the external parts of the penis ulcerate, because there is an irritation in the urethra; and that the urethra cannot be affected with gonorrhœa, because a chancre already occupies the external parts. If this reasoning be not hypothetical and fanciful, we cannot conceive what arguments can ever be considered so. They who talk in this manner, inadvertently fall into difficulties, and make one opinion inconsistent with another. Thus, they have already told us, that, occasionally, a chancre is apt to occur, when patients with gonorrhœa neglect to keep the glans and prepuce clean; yet, according to their principles, a clap renders the external parts insusceptible of infection, and, of course, there would be no need of cleanliness as a preservative. We think that the weakness of the argument must be obvious to the youngest student, who, on his entrance into any venereal ward of an hospital, is almost sure of immediately finding a patient who has at the same time both chancres and gonorrhœa.

The different treatment required by gonorrhœa and the venereal disease, is another argument against the identity of the virus, mercury being unnecessary in claps, and the sole specific in the other complaint. The partisans of the opposite opinion endeavour to diminish the force of this fact, by adverting to the different ways in which the two diseases affect the parts which are attacked, and by maintaining that no just inference can be drawn from the difference of treatment, while the particular action of mercury, on various parts affected with the venereal poison, is not understood. They also contend that, though mercury may have no effect in gonorrhœa, when used in the same way as for other venereal affections, yet, when applied to the urethra itself, it serves to moderate the symptoms, and accelerate the cure.

Having seen the calomel injection employed in some hundreds of cases, with less benefit than the common vitriolic one, we cannot assent to the last observation. The other

remarks, being bare opinions, may be received or not, as the judgment of the reader may incline him; but, for our own part, we have no hesitation in refusing them a place among such information as is founded on rational evidence.

We shall now say a few words, respecting the time, between the application of the infection and the beginning of its effects.

In the greater number of diseases, a certain space of time always elapses between the application of the cause and the first appearance of the effect. The time when a gonorrhœa begins, after contamination, varies considerably in different cases. In some examples, the poison takes effect in a few hours, as Mr. Hunter has seen two or three times; while, in other instances, the complaint does not shew itself till the end of five or six weeks. There are also cases to be met with, in which the disorder begins at all the intermediate periods. It is calculated, that the most common time of its origin is in the space between the sixth and twelfth day. In one instance, in which the malady did not commence till the end of six weeks, it was noticed by Mr. Hunter, that the affection was preceded by various symptoms of irritation, and uncommon sensation, in the parts. Hence, this celebrated author concluded, that the virus seldom, or never, remains so long inactive; but that the inflammatory state may exist a good while before suppuration takes place. The delay in the commencement of the discharge, however, may be owing to causes which are not understood, and this is very likely to be true, if we consider that some cases of gonorrhœa do not begin for five or six weeks after infection, and yet are not preceded by any remarkable symptom whatsoever.

The observations already made in a preceding part of this article, must have apprized the reader, that discharges from the urethra may originate from more causes than one, and from more irritations than that which is produced by one particular kind of virus. There are sometimes spontaneous discharges from this passage, while no immediate cause whatever is assignable. Such instances as occur independently of a specific gonorrhœal, or, according to the Hunterian doctrine, the venereal virus, have been termed *simple* or *benign*. Some assert, that these cases may be known by their coming on immediately after coition, and it is violent from the very beginning; while the virulent gonorrhœa does not commence till after some days, and grows gradually worse. However, this criterion is insufficient: simple gonorrhœas are not always owing to coition, nor are they always sudden in their appearance.

Mr. Hunter has seen the urethra sympathize with the gums in dentition, and all the symptoms of gonorrhœa affect the same infant several times. The author of the article *Gonorrhée*, in the *Encyclopédie Méthodique*, also mentions his having seen two female children, who were affected during dentition with a discharge from the pudenda, attended by a certain degree of inflammation, and pain in making water.

We shall next introduce a few remarks on the effect of the discharge on the parts producing it.

It was formerly not an uncommon opinion, that the discharge was a means employed by nature for carrying off the virus occasioning the complaint, and thus bringing about a cure. However, it is impossible for this to be true, with respect to inflammations, which arise from a specific virus; for, supposing the suppuration could wash away all the poison, causing the original irritation, yet, as all the matter afterwards secreted is equally virulent, no good would be done; the irritation, according to the preceding idea, would be perpetuated, and, of course, the discharge. This

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last occurrence, however, we need hardly remark, is not the case. The affection of the urethra in gonorrhœa is not kept up by the matter, but by the specific quality of the inflammation itself, which, in all probability, can never continue beyond a limited time, since the symptoms at length spontaneously subside. Had the infectious matter, which is formed in the course of the disease, the power of protracting the original irritation, the disorder would have no termination.

In gonorrhœa, as in many other diseases, the morbid action of the parts affected cannot go on for a long while in the same way. After having increased in violence to a certain degree, it naturally tends to become weaker; and the symptoms of the disorder which depend upon such action, at length, entirely cease. The time of this cessation will vary according to circumstances; for if the irritated parts be very susceptible of the specific irritation, the diseased action must be more violent and lasting; but, in all cases, this difference is always owing to some particularity of constitution, and not to any peculiarity of the virus.

The reader is aware that Mr. John Hunter regarded the gonorrhœa as one form of the venereal disease. It was the opinion of this distinguished man, that the venereal disease was only capable of a natural cessation, when it occupied a secreting surface, from which it produced pus. He believed that when the part attacked was not a secreting one, and an ulcer was formed, the disease would of itself go on for ever. He referred this difference between gonorrhœa and a chancre, however, more to the difference in the mode of action, than to that of the affected surfaces; for when the venereal virus produces an ulcer upon a secreting surface, as it sometimes does upon the tonsils, and even the urethra itself, such sores are not more disposed to heal, than if they were situated any where else in the body.

It is sometimes observed, in cases of gonorrhœa, that the parts which were first irritated get well, while the irritation is communicated to another part of the same surface, as happens, when it leaves the urethra near the glans, and affects that part of the canal which is further on towards the bladder.

Admitting that every gonorrhœa is capable of getting well, without surgical assistance, it may be doubted whether a person, who already has a gonorrhœa, is susceptible of the irritation of fresh gonorrhœal matter, or that the clap which exills could be augmented by its application. Mr. Hunter extended the same observation to every form of the venereal disease; and he states, that the matter of gonorrhœa, or of a chancre, put on an ulcerated bubo, does not in the least retard the cure, although, if venereal matter be applied to a common sore, the venereal irritation will frequently be excited. Such facts are strongly in favour of the opinion, that the matter of gonorrhœa has no effect in keeping up the complaint. The urethra is neither irritated by the infectious matter which it secretes, nor can the irritation already existing last beyond a certain period. Even were fresh matter applied to the urethra, the complaint would probably get well with equal quickness.

Mr. Hunter extended the idea further, and even conceived that a fresh gonorrhœa could not be contracted, were fresh virus applied to the parts affected, at the period when the cure was just on the point of being completed. He thought that, in time, the parts might be so habituated to the impression of the virus, as to become insensible of it, and they must have regained their natural and original state, ere the infection can again have such effect upon them as to reproduce the complaint.

The foregoing opinions do not rest altogether upon theory: they are also founded on experience and observation. Men, who have just had a gonorrhœa, have frequently been known to expose themselves to be infected again without any recurrence of the complaint taking place, while other healthy persons, who had connection with the same woman, have immediately caught the malady. Perhaps, it is on the same principle, that the first gonorrhœa is generally the most violent, and that such persons as are often affected with claps have them more and more mildly, particularly when the intervals are short.

In corroboration of these sentiments, Mr. Hunter relates several cases, among which is the following: a married man, who, for several years, had had no connection with any woman except his own wife, happened to meet with an old acquaintance, who gave him a severe gonorrhœa, though she declared her belief that she was quite well. Both adopted some means of cure; but continued to cohabit together during the treatment. The man got well, and it was presumed that the woman was also cured. They continued to live together several months, without the former experiencing any inconvenience, or having any reason to suppose that there was still any thing the matter with the latter. At length they parted, and the woman formed a new attachment. She had no sooner made this last connection, than she gave the new lover a gonorrhœa. She again consulted Mr. Hunter, whom she assured, that she had never cohabited with any others, except the preceding two; and consequently, if this be true, the infection of her last lover must have arisen from the very same gonorrhœa, of which she supposed that she had been formerly cured. However, she now used no remedies, and the man, after he was well, continued to cohabit with her for several months without receiving any new infection. But her old lover now returning, after a year's absence, and thinking that, as she was living regularly with the second, there could be no danger, ventured to have connection with her; the consequence was, that he caught another gonorrhœa.

Before describing the treatment, it is proper to say a few words of the disease in women.

The gonorrhœa in females is not so complicated as in men, the parts affected being more simple and fewer in number. In women the disease is not so easy to be ascertained, because they are also liable to a complaint, called the fluor albus, which has some resemblance. A more running from the parts is not so much a proof of the existence of an infectious gonorrhœa in a woman, as a discharge without pain in a man; and in the former the disease will often exill, while there is no increase whatever in the natural secretion from the parts. Nor can any criterion be deduced from the kind of matter, since the discharge of the fluor albus frequently puts on all the appearances of gonorrhœal matter. Neither is pain, nor any peculiarity in the sensations of the parts, necessarily attendant upon the complaint in women. Mr. Hunter also remarks, that the appearance of the parts often gives us but little information; for he frequently examined them in patients, who complained of all the usual symptoms, such as an increased discharge, pain in making water, soreness, &c. and yet he could perceive no difference in the look of the parts and of such as are quite healthy. When the patient was not conscious of any particular symptoms, or was disposed to conceal her knowledge of them, Mr. Hunter thought that some judgment might be formed from her having had connection with men supposed to be unwell, and from her power of communicating the disease to others. However, it is acknowledged,

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acknowledged, that as this last circumstance is derived from the testimony of another person, there are obvious reasons why it should not always be trusted.

When a woman contracts a gonorrhœa, the vagina must be first attacked, a part which is not endued with considerable sensibility. Frequently, however, the complaint extends much further, producing disagreeable sensations and swellings of the inside of the labia, nymphæ, clitoris, caruncula myrtiliformis, and meatus urinarius. The parts are sometimes so sore that the patient cannot bear them to be touched; she can hardly walk; and a great deal of pain is experienced when the urine comes into contact with the sore surfaces, as it must unavoidably do as often as the bladder is emptied.

When the disease extends to parts which are more sensible than the vagina, and more susceptible of inflammation, women have nearly the same symptoms as men; a fullness about the parts, a discharge from the urethra, violent pain in making water, and great uneasiness from the pressure on the parts in sitting. Sometimes the bladder is also affected.

The inflammation frequently extends to some depth, running along the ducts of the glands, and affecting the glands themselves, so as to occasion hard swellings under the surface of the inside of the labia. These tumours often suppurate, and burst near the orifice of the vagina. They resemble the abscesses in the glands of the urethra in men.

The time in which a gonorrhœa may be cured is exceedingly variable, some cases terminating in a week, while others continue for months under the same treatment.

According to Mr. Hunter, the object in the cure is to destroy the disposition and specific mode of action in the solids of the parts, and, as soon as that change is accomplished, the poisonous quality of the matter produced will also be destroyed. Thus the disease may be cured though not always its consequences.

A gonorrhœa is not capable of being continued beyond a certain time in any constitution, and when the complaint is violent and lasts a long while, it is owing to the parts being very susceptible of such irritation, and readily retaining it.

Since there is no specific medicine for the gonorrhœa, it is very fortunate, as Mr. Hunter observes, that time alone will effect a cure. This celebrated surgeon was inclined to think, that, in cases of gonorrhœa, medicines were seldom of service, perhaps not more frequently than once in ten instances. With the idea, that every gonorrhœa cures itself, he gave certain patients pills of bread, which were taken with great regularity. These persons all got well; but Mr. Hunter thought that some of them were not cured quite so soon as they would have been, had artificial means been employed.

The surgical methods of cure consist of internal remedies and local applications; but in putting any plan of treatment in execution, more attention should always be paid to the nature of the constitution, or to any attending disease in the parts themselves, or parts connected with them, than to the running itself.

The nature of the constitution is principally to be judged of from the local effects of the disease. These are so different in different people as to require a great variety of treatment, a circumstance, says Mr. Hunter, which has been too little attended to, every one endeavouring to attack the immediate symptoms, as if he had a specific for a gonorrhœa.

We are first to consider, whether the inflammation is vio-

lent or mild, common or irritable. When the symptoms are violent, but of the common inflammatory kind, which is to be judged of from the attending circumstances, and particularly from the extent of the inflammation not exceeding the specific distance, the local applications may be either of the irritating or soothing kind. In this example, irritating applications may be less dangerous, than when the inflammation is of the irritable sort, and may have the effect of altering the specific action, the parts afterwards recovering of themselves, as from any other common inflammation. Mr. Hunter, however, expresses his belief, that the soothing plan is the best at the beginning.

When the inflammation is great, and of the irritable kind, no violence is to be used in the treatment, as the symptoms would thus only be increased. Mr. Hunter thought, indeed, that there were some cases, which are exceptions to the latter remark, the great degree of inflammation arising entirely from a susceptibility of this irritation, and not from any general irritability in the constitution. He confesses, however, that such examples can seldom be discriminated.

When the symptoms run very high, nothing should be done to stop the discharge, as, were it to be checked, the inflammation would still continue, and no good be effected.

Mr. Hunter recommends us to alter the constitution, if possible, by remedies adapted to each disposition, with a view to alter the actions of the parts arising from such dispositions, and reduce the disease to its simple form. If the constitution cannot be altered, we can only allow the action to wear itself out.

When the inflammation has considerably abated, and the disease only remains in a mild form, its cure may be attempted either by internal remedies, or local applications. If local means are used, violence is still to be avoided, because it may bring back the irritation. At this period (continues Mr. Hunter), gentle astringents may be applied with a prospect of success; or, if the disease has begun mildly, and there are no signs of an inflammatory disposition, either of the common, or irritable kind, an irritating injection may be used, in order to get rid of the specific mode of action quickly. Such application will increase the symptoms for a time; but, when it is left off, they will frequently abate, or wholly disappear. In such a state of parts, astringents may be used: for the only thing to be done, is to procure a cessation of the discharge, which is now the principal symptom.

When the itching, pain, &c., are felt for some time before the discharge appears, Mr. Hunter rather prefers the soothing to the irritating plan of treatment. He suspected, that thus the coming out of the discharge would be promoted, which occurrence he conceived was the first step towards a resolution of the irritation. He believed that, at all events, in this case, the employment of astringents would be bad practice, as, by preventing the discharge from taking place, they might prolong the inflammation, and protract the cure. Also, in cases of strictures, and of diseased testicles, he is adverse to the use of astringents; for, says he, while the discharge lasts, both the other complaints are relieved.

The internal remedies commonly recommended in a gonorrhœa, may be divided into evacuants and astringents. The evacuants (says Mr. Hunter), are principally of the purgative, or diuretic kind, and these are not confined to any particular medicines, every practitioner supposing that he is in possession of the best. Some use mercurial evacuants; whilst others carefully avoid mercury in every form. The neutral

neutral salts have been given from the idea of their being cooling. Some of the profession have chiefly kept to diuretics, perhaps with two views; first, as evacnants acting mechanically upon the urinary passages, so as to wash away the matter; secondly, as specifics. For this purpose, nitre has been given, a medicine which has always been thought to have great effect in lessening inflammation, though Mr. Hunter had doubts concerning the truth of the opinion. Under every mode of treatment the patients always get well, and the cures are ascribed by each practitioner to his own favourite method.

Mr. Hunter remarks, that "to keep the body open in most cases, even when the patient is in other respects in health, must, no doubt, be proper; but what idea can we form of an irritation, produced all along the intestinal canal, curing a specific inflammation in the urethra? Yet there are cases where a brisk purge has been of service, and even in some has performed a cure. But I suspect, that, in such cases, the disease had been continued by habit only, and that this practice would not have succeeded in the beginning. A gentleman had a gonorrhœa, all the symptoms of which continued for two months, and by taking at once ten grains of calomel, which purged him most violently, he was almost immediately cured. The calomel could not have acted specifically, but by a kind of derivation, that is, an irritation produced in one part, cured one that subsisted in another; but even if it should be granted, that in some constitutions purges have the power of making the solids less susceptible of this irritation, it cannot be supposed they will have this effect in every case: in some constitutions, they might debilitate, increase irritability, and of course increase the symptoms. These contrary effects must take place in different constitutions, in which a medicine has no specific action. On the supposition of the cure being promoted by an evacuation from the blood, what service can purging out some of the blood, in form of a secretion from one part, do to an inflammation of another part? On such a supposition would not a sweat, or an increase of saliva, by chewing tobacco, or stimulating the nose by snuff, all tend equally to cure a gonorrhœa? But humours having been considered as the universal cause of every disease, especially those in which pus is formed, or a discharge produced, and purging having been supposed to be the cure for humours, purgatives were of course made use of in this disease; and as the patients have always been cured, the practice became generally established.

"Those who recommended mercury in this form of the disease, did it most probably from the opinion, that this medicine was a specific for the venereal disease in all its forms. On this supposition, we can see some reason for their practice, as it would be absorbed from the intestines, circulate through the inflamed vessels of the urethra, and thereby destroy the venereal irritation. Here we can only suppose it to act by its specific virtue; but I doubt very much of mercury having any specific virtue in this species of disease; for I find, that it is as soon cured without mercury as with it; and where this medicine is only used as a purge, or purged off the next day, and therefore allowed to act merely upon the bowels, I cannot conceive that it could have any more effect upon the venereal inflammation in the urethra, than an irritation in the bowels arising from any other purgative. So little effect, indeed, has this medicine upon a gonorrhœa, that I have known a gonorrhœa take place while under a course of mercury sufficient for the cure of a chancre. Whether the gonorrhœa arose from the same infection that produced the chancre I cannot say; nor can it be easily determined in such cases. Men have also been known to contract a go-

norrhœa when loaded with mercury for the cure of a lues venerea; the gonorrhœa, nevertheless, has been as difficult of cure as in ordinary cases." P. 72, &c.

With respect to diuretics, considered as evacnants, Mr. Hunter observes, that they may have the same general remarks made on them as have been offered in regard to purgatives. It is possible, says he, that specific medicine, taken into the constitution (if we had such), and passing off by the urine, might act upon the urethra in their passage through it. The balsams and turpentine pass off in this way, and become specifics for many irritations in the urinary passages; but how far medicines which have the power of affecting particular parts when found, or when under diseases peculiar to those parts, have also the powers of affecting a specific irritation in them, Mr. Hunter was uncertain. He conceived, however, that they might be capable of removing any attending irritation, though not the specific one. He thought, that diuretics did good inasmuch as they increased the quantity of urine; but he believed simple water was best for this purpose, or water joined with such things as encourage the patient to drink a good deal, as with tea, capillaire, orgeate, &c.

Astringents have frequently been prescribed, though without the approbation of the generality of regular practitioners. It was Mr. Hunter's opinion, that such medicine did not lessen the inflammation, but that they often lessened the discharge.

With regard to local applications, they may be either internal to the urethra, or external to the penis. In many cases both kinds are proper. One would be prone to think that what is applied to the urethra, must be the most likely to effect a cure, by coming immediately into contact with the diseased parts.

Local applications to the urethra may be either in a solid or fluid form, each of which has its advantages and disadvantages. A fluid, (says Mr. Hunter) is only a temporary application, and that of very short duration.

The solid applications may remain a long time, and in this respect, would seem to be better than fluid ones; but in general they create irritation. They must be used in the form of a bougie, which Mr. Hunter imagined was commonly injurious, when the parts were in an inflamed state, though he confesses, that he never saw any harm from it in any case, when employed with caution.

Fluid applications to the inside of the urethra are usually called injections, and, like the internal remedies, are without number. However, as the inflammation is frequently removed under the use of injections of various kinds, have we not, (as Mr. Hunter notices) a strong corroborating circumstance in favour of an opinion, that every such injection will in time cure itself? This eminent surgeon thought, however, that practice evinced, that an injection often has almost an immediate effect upon the symptoms, and, therefore, that it must have some powers, though the injection, which would have the greatest specific effect, he believed, was not yet known. If an injection has no specific powers, it must be very uncertain in its effects, and can only be of service as far as it may be adapted to a peculiarity of constitution, or parts. As injections are only a temporary application, it becomes necessary to use them often, especially in cases where they are found to be of service. They should therefore be applied as often as convenient, perhaps every hour, or even oftener; but Mr. Hunter adds, that this must be regulated in some measure by the kind of injection, for, in order that it will not be proper to use it too often, as it may be productive of bad consequences.

The same author observes, that many injections remove

the symptoms immediately, or soon after the application, and prevent the formation of matter, which has given rise to the notion of their shutting up the disease and driving it into the constitution; but this supposition cannot be true, since the matter is the only substance in which the poison is contained, and the formation of the poison is inseparable from the formation of matter. Therefore, if we can prevent the one, the other cannot take place, and, of course, there can be no room for absorption; so that there can neither be any power of infecting the constitution in the same person, nor of communicating the infection to others.

Mr. Hunter divided injections into four kinds, namely, the irritating, sedative, emollient, and astringent. He believed that we are not acquainted with any specific one, although a mercurial injection, of some sort or another, is frequently fancied to have such a quality.

All irritating injections act upon the principle of producing an irritation of another kind, which ought to be greater than that of the gonorrhœa, by which means the last is destroyed and the disease cured, although the pain and discharge may still be kept up by the application.

These symptoms will soon go off, as soon as the injection is laid aside, because they only arise from its irritating qualities. In this way bougies, as well as many injections, may be supposed to perform a cure; and although they increase the symptoms for a time, they never can increase the disease itself, any more (says Mr. Hunter) than the same injection, which would produce the same symptoms, if applied to the urethra of a sound man, can communicate the disease. Most of the irritating injections have an astringent effect, and, when mild, prove simply astringents; their irritating quality depending chiefly upon their strength.

Mr. Hunter was not able to determine absolutely the kind of cases in which irritating injections might be used with advantage. He thought, however, that such applications should never be used when there is already much inflammation, especially in constitutions which cannot bear a great deal of irritation, as a previous knowledge of the disease in the same person sometimes teaches us. Neither should these injections be used when the irritation has spread beyond the specific distance; when the testicles are tender, or when they have become sore upon a sudden diminution of the discharge; when the perinæum is very susceptible of inflammation, and particularly if it should have formerly suppured. Irritating injections also ought not to be employed when there is a tendency in the bladder to irritation, which is known from the patient having had, for some time, a frequency in making water. In all the preceding cases they do no good, and often do mischief: Mr. Hunter thought he had seen abscesses in the perinæum brought on by their employment.

In mild cases, and in constitutions which are not irritable, such injections often succeed, and remove the disease almost immediately. The practice, however, as the foregoing writer remarks, ought to be attempted with caution, and not, perhaps, till milder methods have failed. Two grains of corrosive sublimate (*hydrargyrus muriatus*), dissolved in eight ounces of distilled water, are an eligible injection of this kind; but an injection of only half this strength may be used, when it is not the design to attempt a very sudden cure. If, however, the injection thus weakened should give considerable pain, or occasion a great increase of soreness in making water, it must be still more diluted.

Sedative injections, according to Mr. Hunter, will always be of service in cases where the inflammation is considerable, not by lessening the disease itself, but by lessening

the diseased action, which always allows the natural actions of the part more readily to take place. They are likewise very useful in relieving the painful feelings of the patient. Perhaps, says this celebrated surgeon, the best sedative which we have is opium, as when given by the mouth or anus, as when applied to the part affected in the form of an injection. But even opium will not agree, nor act as a sedative in all constitutions or parts. On the contrary, it has often opposite effects, producing great irritability. Lead may be reckoned a sedative, so far as it abates inflammation, while, at the same time, it may act as a gentle astringent. Fourteen grains of saccharum saturni (acetite of lead), dissolved in eight ounces of distilled water, make a good sedative astringent injection.

Mr. Hunter next remarks, that the drinking freely of diluting liquors may, perhaps, be considered as having a sedative effect, as it in part removes some of the causes of irritation, rendering the urine less stimulating, either to the bladder, when the irritation is there, or to the urethra in its passage through it; and the plan may possibly lessen the susceptibility of irritation. The vegetable mucilages of certain seeds and plants, and the emollient gums, are recommended for impregnating the patient's drink. Such substances pass off with the urine, and render the evacuation of that fluid less painful. It is proper to notice, however, that Mr. Hunter does not appear to have a high opinion of the utility of this practice.

When the inflammation is very great, Mr. Hunter believed, that emollient injections are the most proper applications. It seems probable, that they act first by simply washing away the matter, and then leaving a soft application to the part, in which way, says this eminent writer, they can be of singular service by lessening the irritating effects of the urine. A solution of gum arabic, milk and water, or sweet oil, will frequently lessen the pain and other symptoms, when the more active injections have done nothing, or seemed to do harm.

When great irritation and soreness prevail at the mouth of the urethra, the point of the syringe cannot be introduced, and no attempt to use an injection ought to be made before the inflammation abates. Emollients may be used externally in the form of fomentation.

The astringent injections, observes Mr. Hunter, can only act by lessening the discharge. They can have no specific effect upon the inflammation. They should only be used towards the latter end of the disease, when it has become mild and the parts begin to itch. However, if the disease should begin mildly, they may be used at the very beginning; for, by gradually lessening the discharge, without increasing the inflammation, we complete the cure, and prevent a continuation of the discharge called gleet. If the astringent injections be strong, they will be irritating, and frequently increase the discharge, instead of diminishing it. When weaker, they often stop the running, without hastening, however, the cure in all cases; for the inflammation may still continue even longer than it would have done, had the tendency to secretion not been removed. But sometimes an astringent injection will cure a slight irritation in a very few days. Mr. Hunter never found one astringent more efficacious than another. The astringent genus, as dragon's blood, the balsams, and the turpentine, dissolved in water; the juices of many vegetables, as oak bark, Peruvian bark, tormentil root, and, perhaps, all the metallic salts, as green, blue, and white vitriols; the salts of mercury, and also alum; probably all act much in the same way. Mr. Hunter, however, owns that they do not act equally well in every gonorrhœa.



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norrhœa, and that changing the injection will often succeed, when a long perseverance in a previous one would not.

We have to observe, that the astringent injection, which is most generally approved of by practitioners, is that containing white vitriol (zincum vitriolatum), about half a scruple of which, dissolved in eight ounces of water, is a very good application to begin with. The strength may be increased or diminished, however, as the patient's feelings may require.

Poultices and fomentations have been used as external applications in cases of gonorrhœa; but, says Mr. Hunter, they can be of little service, except when the prepuce, glans, and orifice of the urethra are inflamed. It is now more common, in the inflammatory stage of the complaint, to surround the penis with linen kept continually wet with the saturnine lotion.

When any of the glands of the urethra remain in an indurated state, after the subsidence of the inflammation, the hardness may be removed by frictions with camphorated mercurial ointment.

It is remarked by Mr. Hunter, that in women, the mode of curing the gonorrhœa is nearly the same as in men; but the disease itself is milder, and the secondary symptoms less numerous in females. Hence the cure is more simple.

When the disease is confined to the vagina, it may be easily cured by means of injections, taking care also to wash the external parts with the application. The patient cannot, however, apply an injection to the meatus urinarius, when that passage is affected.

The same kinds of injections are proper for women as are prescribed for men; but they may be made doubly strong, as the parts in women are not nearly so irritable as the common seat of this disease in the other sex.

When the inflammation runs along the ducts of the glands, either of the mouth of the vagina, or of the urethra, or where it affects the glands themselves, the case claims the same treatment as in men. The mercurial ointment should be freely applied to the indurated parts. When the ducts and glands suppurate and form abscesses, these should be opened and dressed like a sore. The ulcer, however, is not regarded as venereal. Though Mr. Hunter entertained such a sentiment, and directed a corresponding treatment.

In plethoric constitutions, the symptoms are frequently violent, attended with a strong propensity to the inflammatory fever. The inflammation, however, does not extend beyond the specific distance. Many medicines, which might be of service in another constitution, here do harm, and increase the symptoms which they were intended to relieve. Mr. Hunter has seen opiate glysters, after at first doing good, bring on fever and an exasperation of all the symptoms. He has seen the balsam capivi render the inflammation worse. The treatment of such a constitution, when affected with this disease, should chiefly consist in bleeding and gentle purging. It is proper also for the patient to live sparingly, and use little exercise.

In the weak and irritable constitution, as Mr. Hunter observes, the symptoms are frequently very violent, and often extend beyond the specific distance, the inflammation running along the urethra, and even affecting the bladder. In this instance the foregoing author was of opinion, that a strengthening plan should be adopted.

Sometimes a gonorrhœa is so capricious in its cure, that the accession of an accidental fever stops the discharge, removes the pain in making water, and the disorder is permanently cured. Sometimes the symptoms cease on the commencement of the fever, and return when the latter complaint is well. In other examples a gonorrhœa may

begin mildly; but a severe fever coming on and continuing for several days, the symptoms of the first disorder are rendered much worse, and, on the fever going off, the gonorrhœa likewise disappears. Mr. Hunter remarks, that although a fever does not always cure a gonorrhœa, yet, as it possibly may, nothing should be done while the fever lasts; and if the local complaint should continue after the fever is gone, it is then to be treated according to the symptoms.

The same writer represents, that, unfortunately, there are cases in which no known method lessens the symptoms; evacuations, a strengthening plan, sedatives and emollients, all prove useless, and time alone seems to bring about the cure. In these instances, Mr. Hunter thought the soothing plan of treatment the most advisable, and was against the employment of astringents. Neither had he much opinion of the capivi and Canada balsams, nor of turpentine in general, though they might diminish the discharge.

A gonorrhœa is also considerably affected by the patient's way of life, during the inflammatory state. Most things which hurry or increase the circulation, aggravate the symptoms, such as violent exercise, drinking strong liquors, eating strong indigestible food, taking peppers, spices, spirits, &c.

When the complaint begins mildly, or after the violent symptoms have subsided, we may prescribe medicines which will assist the above local remedies, in checking the discharge. Mr. Hunter thought the turpentine the most efficacious. Cantharides, cuprum vitriolatum, acetite of lead, and alum, have also been recommended.

The reader is already aware, that Mr. Hunter regarded gonorrhœa as a disease arising from the venereal poison, and believed that the matter from the urethra, if introduced into the circulation, would occasion a lues venerea. In order to guard against the effects of absorption, he was an advocate for exhibiting small doses of mercury at an early period of the malady, and for continuing them even for some time after the formation of matter is at an end. He advised a grain of the hydrargyrus calcinatus to be taken every night, or every evening and morning; but frictions, with the mercurial ointment, when mercury disagreed with the stomach and bowels. Many practitioners at this day are strongly attached to the system of prescribing a grain or two of calomel every day during the treatment of a gonorrhœa, and deem it unsafe to abstain altogether from the use of mercury, in some form or another. Others give calomel with a view of its acting as an alterative and purgative. We never have seen any reason, however, for exhibiting either the hydrargyrus calcinatus, or calomel, or for employing mercury in any mode whatsoever.

Before closing the present article, it only remains for us to say a few words respecting some complaints, which are occasionally attendant on gonorrhœa.

When the inflammation is violent, or spreads along the urethra, there is frequently a discharge of blood from the vessels of that part. Mr. Hunter states, that in such cases the balsam capivi has been found serviceable; but that he did not observe any good result from the use of astringent injections.

Opium alone, or joined with camphor, is the best medicine for the prevention of painful erections. Cicuta is also said to prove useful for the same purpose.

With regard to the treatment of chordee, Mr. Hunter remarks, that in the beginning of this complaint bleeding from the arm is often of service, but that it is more immediately useful to take away blood from the part itself by leeches. Great benefit often follows the accidental bursting of a vessel, and a profuse hemorrhage. Relief is often ob-

tained from exposing the penis to the steam of warm water. Poultices and fomentations, especially such as contain camphor, are frequently productive of benefit by removing the inflammation. Opium given internally is of singular service, and is still more beneficial when joined with camphor. It lessens the pain and prevents erections, which are the immediate cause of the complaint.

When the chordee continues after all the other symptoms are gone, the only remaining object is to promote the absorption of the extravasated coagulable lymph, by friction with mercurial ointment on the parts. Mr. Hunter informs us, that in one case considerable benefit seemed to result from giving cicuta, after the common methods had failed. Electricity, he says, may also be of service. A chordee is often longer in disappearing than either the running or pain; but, like most of the consequences of inflammation, its declension is gradual and uniform.

Mr. Hunter has seen the kind of chordee, which seems to depend on spasm, relieved by bark.

When the glands of the urethra suppurate, Mr. Hunter advises the use of mercury, just as if the case were a chancre; but this practice is not deemed necessary by the most judicious surgeons of the present day. It is proper to make an early opening into the abscess, when Cowper's glands suppurate, in order to prevent the matter from making its way into the urethra or scrotum.

When the bladder is affected with irritation, in consequence of gonorrhœa, opiate clysters, the warm bath, and copious bleeding, are the chief means of relief. Leeches applied to the perinæum have also good effects. Bleeding, however, in certain constitutions, is hurtful, and should always be resorted to with caution. When the complaint lasts very long, resisting ordinary methods, Mr. Hunter suggests the trial of an opiate plaster on the pubes, or small of the back; or a small blister on the perinæum.

The mode of treating a swelling of the testicle, we shall consider under the head, *HERNIA Humoralis*.

The decline of a gonorrhœa is generally known by the pain becoming less, or changing into an itching, similar to what is often felt in the beginning of the complaint, and which at length goes away altogether. The sense of weariness about the loins, hips, testicles, and scrotum is no longer felt; and the cherry-like appearance of the glans penis gradually subsides. The running diminishes, or at all events becomes whiter, then paler, and by degrees assumes a more slimy consistence, in proportion as it becomes more like the natural secretion, which is designed to lubricate the urethra.

Recurrences of the disease every now and then are met with, after the pain, discharge, &c. have quite ceased. Such relapses, however, are more common in women than men, and the complaint is usually in a milder form than before.

GONRA, in *Geography*, a town of Hindoostan, in Bundelcund; 20 miles N. of Callinger.

GONS, a town of Hungary; 22 miles S.S.W. of Zatzmar.

GONSALVO, HERNANDEZ DE CORDOVA, in *Biography*, an eminent Spanish commander, was born in 1443, and brought up from a very early age to the profession of arms. He signalized himself in a war against Portugal, and under the reign of the celebrated Ferdinand and Isabella he served in the conquest of Grenada. He was afterwards employed to succour Ferdinand king of Naples against Charles VIII. of France, and by his assistance the whole of that kingdom was recovered from the French. Kings, however, are not always consistent in their projects, and the

monarch of Spain who had defended and saved one king of Naples, formed a project of supplanting his successor, and making a partition of the country with Lewis XII. of France, and Gonfalso was employed to execute the attempt. The warrior was completely successful, and made Alphonso, son of the king of Naples, his captive. Elated with his success, and willing to shew his moderation, Gonfalso swore upon the holy sacrament, a wretched abuse of a religious rite, that the young prince should enjoy his liberty; but after the surrender was complete, and the time was come when he could execute his promise, he pretended that he had received new orders from his own sovereign, which obliged him to send Alphonso a prisoner into Spain. The partitioning powers soon disagreed among themselves, and the French, being in a greater state of preparation, attacked, defeated, and expelled the Spaniards from most of the places which they possessed. Gonfalso was now compelled to retire with his army, destitute of money, provisions, and ammunition. He retired, however, only to recruit himself, which he had an opportunity of doing among the Venetians, when he rallied, drove the French before him, and entered Naples in triumph. Ferdinand, in the mean time, doubtful of the event, had negotiated a treaty with Lewis, confirming their former partition; but upon the intelligence of the great success of Gonfalso, such was "Spanish honour," that he refused to sign it, and the French were, by the efforts of Gonfalso, obliged entirely to evacuate the kingdom of Naples. For these and other eminent services, he not only obtained the title of the "Great Captain," but was rewarded by his sovereign with many valuable as well as honourable posts of honour. He was made constable of the kingdom of Naples, raised to the dukedoms of Terranova, St. Angelo, and other estates. He at length fell under the suspicion of his sovereign, who sent letters to recal him, which the general repeatedly eluded upon different pretexts. The king determined to go to Naples, and was met at Genoa by Gonfalso. They entered Naples together in apparent harmony, and the king conferred an additional dukedom on his "Great Captain," but Ferdinand thought it prudent, in the following year, when he left Naples, to take his general with him. At Savona they had an interview with Lewis XII. who shewed his esteem for Gonfalso, by decorating him with a gold chain taken from his own neck, and causing him to sup at the same table with himself. At Venice also he received some magnificent presents. On his arrival in Spain, he was commanded to retire to his own estate at Grenada, where he died in 1515, at the age of seventy-two. Gonfalso is distinguished as a firm disciplinarian, a great master of the art of war, but as one who was never distinguished for generosity of sentiment. Univer. Hist. Moreni.

GONSALVO, *St.*, in *Geography*, a town of Brazil, in the government of St. Salvador; 40 miles W. of Sergipe.

GONTAPILLY, a town of Hindoostan, in the circar of Cicacole; 25 miles S. of Cossimcotta

GONUS, in *Botany*, from *γόνος*, offspring, because of its plentiful produce. Lour. Cochinch. 658.—Class and order, *Polygamia Dioecia*, Loureiro: rather *Tetrandria Tetragynia*. Nat. Ord. *Terebinthacea*, Juss. ?

By Loureiro's description of his only species, *G. amarifinus*, a shrub with pinnated serrated hairy leaves, and by his reference to Rumph. Amboin. Append. t. 15, it should seem to be allied to *Fagara*, though the description of the pistil and fruit does not exactly answer. It agrees perhaps best with *Brucea*, Juss. 373, both in botanical characters and medical properties; see that article. Loureiro says his plant is found in the woods of China and Cochinchina, and that the

the virtues of the root and fruit are diaphoretic, alexiteric, antifebrile, and anthelmintic. He adds, that "it seems to be the same drug which the Portuguese call *radix de Solor*, because it grows in the island of Solor, as well as in Timor, and which is in great use in India." Is the *Brucea*, after all, an Indian plant?

GONWA, in *Geography*, a town of Hindoostan, in Guzerat: 20 miles N.W. of Amood.

GONYALGIA, of *γων, knee, αλγος, pain*, a term used by some authors to express a violent pain in the knee.

GONZAGA, LUCRETIA, in *Biography*, daughter of Pirro Gonzaga, lord of Gazzuolo, was distinguished as a literary lady in the sixteenth century. The celebrated Banello was one of her masters; by him she was introduced to the knowledge of the Greek tragedians. She married, at the age of fourteen, Gianpaola Manfredi of Ferrara, which proved an unfortunate union, since her husband, on account of a plot against the life of duke Hercules II. was capitally condemned in 1546. The duke did not cause the sentence to be executed, but was contented with keeping him in perpetual imprisonment, under which he died in 1552. His faithful spouse, Lucretia, employed all her powers to obtain his liberation: she is said to have addressed letters to almost all the powers in Europe, imploring their intercession, and one to the grand seignior, intigating him to make an attack upon the fortrels where her husband was confined. It must be observed, that these letters have been imputed to Ortensia Landi; it cannot, however, be doubted, that this lady had acquired a considerable literary reputation by being supposed capable of such productions. She was, indeed, panegyriced by most of the learned in Italy in her time, among the rest by Julius Cæsar Scaliger, and a volume of poems in her praise was published in Bologna in 1565. Several of her works were printed, one of which was a small volume of poems. She remained single after the death of her husband, and placed her two daughters in a convent. She died at Mantua in 1576. Moreri.

GONZAGA, SCIPIO, born in 1542, was son of Charles, count of St. Martino, of the branch of the Gonzagas, dukes of Sabbionetta. He was carefully instructed in letters, and sent to Padua to complete his studies, where he greatly distinguished himself in classical literature. He afterwards acquired considerable reputation for his knowledge in theology and philosophy. Muretus, in 1571, dedicated to him the first volume of his Orations, with a high panegyric: and Guarini submitted to his criticism his "Pastor Fido." He was created cardinal in 1587, and died at Samartino in the year 1593, leaving behind him commentaries of his own life, written in elegant Latin. Moreri.

GONZAGA, VESPASIAN, duke of Sabbionetta, born in 1531, is celebrated as a commander in the service of Charles V. and Philip II., but he is still more distinguished as a splendid promoter of the arts and sciences. He built from the ground the city of Sabbionetta, which, for the neatness and regularity of the streets, the architecture of the private houses, the beauty of the churches, and the elegance of the public buildings, has excited universal admiration. He also founded in it a public school for the learned languages, to which he invited as a professor Mario Nizzoli, one of the most learned men of the age. His palace was always full of men of knowledge and science, of whom he was the liberal patron. Gonzaga employed Scamozzi in the erection of a very fine theatre, for the performance of dramatic pieces, and he is himself recorded as an elegant Italian poet. He is mentioned with high respect and applause by Tasso, and other literary characters, and he is noticed as a collector of books.

GONZAGA, in *Geography*, a town of Italy, in the department of the Mincio; 16 miles S. of Mantua.

GONZAGO, ST., a town of Peru, in the audience of Quito; 60 miles N.W. of St. Josef de Huales.

GONZALES, BARTOLOME, in *Biography*, a painter, born at Valladolid in the year 1564. He frequented the school of Patricio Caxes at Madrid; in the sequel painted much for Philip III. at Burgos, Valladolid, Lerma, in the Pardo and Escorial, till 1617, when he was made painter to the court, in the place of Fabricio Castello. His portraits are admirable, especially the six whole lengths with the date 1621, possessed by the baron of Casa Davalillo. In history, his style was ornamental; his drapery, a varied imitation of stuffs, by its illusion captivated the vulgar, whilst it destroyed the dignity, simplicity, and generally the costume of the subject. He died in 1627, not, as Palomino states, in 1611. Fuseli's Pilkington.

GOOBER, in *Geography*, a country of Africa, S. of Wangara, between 10° and 12° N. lat. and 15° and 25° E. long. The mountains of Koumri, so called by Abulfeda, commence in this territory.

GOOCHLAND, a county of Virginia, in America, surrounded by Louisa, Fluvanna, Henrico, Hanover, and Powhatan counties; about 40 miles long and 14 broad, and containing 4893 free inhabitants, and 4803 slaves.

GOOD, or GOODNESS, denotes whatever tends or conduces to preserve or improve human nature or society; in opposition to *evil*, which tends to destroy, injure, or impair the same.

Hence good is divided by the philosophers into 1. *Bonum sui*, private good; which is that whereby a thing tends to preserve, &c. itself, under which comes that popular division of goods of body, mind, and fortune.

2. *Bonum communis*, whatever promotes the interest and welfare of society; as all the civil offices, &c.

GOOD, in *Metaphysics*, or *Metaphysical Good*, called also *absolute* or *real good*, and *good per se*, is the essential perfection or integrity of a thing whereby it has every thing that belongs to its nature.

In this sense, all things are good, inasmuch as they have the perfections naturally belonging to things of their kind. Thus, a thinking substance is good, or perfect, as it has all the essential attributes of thought; so an extended substance is good, as it possesses all the parts necessary to constitute it such.

In effect, as it is absurd to imagine a being without its essence, so is it to imagine a being without the requisites of its essence: so that it appears an error in some philosophers, who divided beings into good or perfect, and evil or imperfect. See ESSENCE.

Others define metaphysical, or transcendental goodness, by congruency with the divine will, which, they say, constitutes the measure of all real goodness.

GOOD, *Physical* or *Natural*, is that whereby a thing possesses all things necessary to its *bonè esse*, i. e. its well being, or second perfection, and to the performance of its functions and uses.

In this sense, physical goodness coincides with physical perfection.

To this are required the several powers and faculties, in their proper degree; a due situation, figure, and proportion of parts, &c.

Note, beside absolute physical goodness, there may be a *relative* one; as in foods, which to one, are salutary, to another poison, &c. To this head also belong the things good *pro tempore*, or according to circumstances; as the amputation of a mortified limb, &c.

Natural good may be otherwise defined to be that which makes or denominates a being happy, or prepares him for happiness; or, at least, prevents or removes his misery: accordingly, good is either objective or formal; *objective* good is that which makes us happy; *formal* good, or the pleasure resulting from the application of the faculty to the object, is that which denominates us happy.

Good, *Moral or Ethical*, is the agreement of a thinking, reasonable being, and of the habits, acts, and inclinations of such a being with the dictates of right reason, and the will of the Creator, as discovered by natural light. See VIRTUE.

In order to this, it is not enough that a thing done, said, thought, desired, be just and good; but it must be done, thought, &c. well, *i. e.* from good principles, and to good ends.

Others define moral good more largely. *Moral*, which they also call *relative* good, according to them, is something that is good to another, or that tends some way to the perfection thereof. In this sense they divide it into three kinds, *honestum, jucundum, and utile.*

The first, *bonum honestum*, is what agrees with right reason, and is desirable for itself; as all things virtuous; *e. gr.* to love God, respect our parents, &c. It is considered without any regard to pleasure; not but there is sincere pleasure annexed to it. Zeno and the Stoics allow of no other goods; those of the body, &c. they call *commoda, conveniences*, not goods.

*Bonum jucundum* is that which is good, as it tends to give us pleasure, and is desired on that account; but without any repugnancy to virtue or right reason; as music to the ears, painting to the eyes, &c.

*Bonum utile, or commodum*, is that which is good on account of something else for which it is desired; as money, riches, &c.

Good, *chief, sovereign, or supreme, summum bonum*, is that, the enjoyment of which renders men truly and completely happy. The schools distinguish this chief good of man into that which is simply and adequately so, and beyond which there can be no other; and an inferior, subordinate kind, which is, in some measure, attainable in this imperfect state. This last they call *felicitas viatorum*, and the former *felicitas comprehensorum*. The chief or sovereign good, according to the idea collected of it from the original, natural, and universal preconceptions of all mankind, is something agreeable to our nature, conducive to well-being, accommodate to all places and times, durable, self-derived, and indeprivable; and this consists, says Mr. Harris, in rectitude of conduct, or in living perpetually selecting, as far as possible, what is congruous to nature, and rejecting what is contrary, making our end that selecting and rejecting only. Three Treatises, &c. 1765, p. 121, &c. 205, &c.

Philosophers are divided as to what the chief good of man consists in; whether in the goods of fortune, of body, or of mind. Some hold riches and honours the supreme good; others, as Aristippus and the Cyrenaic school, bodily pleasures; and others, as Zeno and the Stoics, virtue, or living according to nature. The Peripatetics agreed with the Stoics in maintaining that virtue is the *summum bonum*: but the Stoics asserted farther, that virtue was the only good: whilst the Peripatetics denied, with reason, that virtue was self-sufficient, and therefore required several other things as auxiliaries, such as health, prosperity, friends, &c. which are to the virtuous man in the nature of instruments or ornaments to his felicity. An excellent writer lays down the following *criteria* or characteristics of the *summum bonum*, or chief good, which reason can demonstrate to be actually designed for man: it is something which all men, if not want-

ing to themselves, may be possessed of; it is one and the same to all mankind; and while in itself fitted to make the possessor happy, is not prevented in its operation by some other thing which keeps him from relishing it: and as to the highest good which it is possible for man to enjoy, it must be referred to no other, but all others must be embraced for the sake of this; and it must be sufficient to furnish a happiness adequate to the capacities of human nature, and of equal duration; *i. e.* it must be not only perfect whilst it lasts, but everlasting. According to these characters we may infer, that neither the goods of fortune, nor those of the body, nor even virtue itself, constitute the chief good. Virtue, rightly understood, is the perfection of human nature; it is the instrument of obtaining happiness: but this alone will not make a man happy; it is farther necessary that he be perfect as to life, or happy in the circumstances of his being: and, therefore, natural reason demonstrates, that the favour of God, secured by virtue, is properly man's supreme good. Grove's System of Moral Philosophy, vol. i. part. 1. passim. See EPICUREANS, PERIPATETICS, and STOICS.

GOOD-will. See BENEVOLENCE.

GOOD Works. See MERIT and SUPEREROGATION.

GOOD Bearing, *bonus gestus*, in a *Law Sense*, is particularly used for an exact carriage or behaviour of a subject towards the king and his liege people; to which some men, upon their misbehaviour, are bound.

The justices are empowered by 34 Edw. III. cap. 1. to bind in this manner all them that be not of good fame; under which general expression, it is holden that a man may be bound to his good behaviour for causes of scandal, *contra bonos mores*, as well as *contra pacem*; as, for haunting bawdy-houses; for keeping bad women in his own house; or for words tending to scandalize the government; or in abuse of the officers of justice, especially in the execution of their office: a justice may also bind over all night-walkers, eaves-droppers, such as keep suspicious company, or are reported to be pilferers or robbers, common drunkards, whore-masters, the putative fathers of bastards, cheats, idle vagabonds, and any other persons, whose misbehaviour may reasonably bring them within the general words of the statute. Persons of this description may be bound, with one or more sureties, in a recognizance or obligation to the king, entered on record, and taken in some court, or by some judicial officer, whereby the parties acknowledge themselves to be indebted to the crown in the sum required, *e. gr.* 100*l.* with condition to be void and of none effect, provided that they behave themselves well, either generally or specially, for the time therein limited; as for one or more years, or for life. This recognizance, if taken by a justice of the peace, must be certified to the next sessions, by 3 Hen. VII. cap. 1. and if the condition of it be broken, the recognizance becomes forfeited or absolute; and being estreated or extracted, (*i. e.* taken out from among the other records) and sent up to the exchequer, the party and his sureties are become the king's debtors, and are sued for the several sums in which they are bound. All persons under the king's protection may obtain such security, upon due cause shewn; and the justice may be compelled to grant it by a mandatory writ, called *supplicavit*: but this writ is seldom used, for, when application is made to the superior courts, they usually take the recognizances there, under the direction of the statute 21 Jac. I. cap. 8. A recognizance may be discharged, either by the demise of the king, or by the death of the principal party bound thereby, or by order of the court to which it is certified by the justices. He that is bound to this, Lambard says, is more strictly bound than to the peace;

peace; because, whereas the peace is not broken without an affray, battery, or such like, this surety *de bono gestu* may be forfeited by the number of a man's company, or by his or their weapons or arms, by speaking words tending to sedition, or by committing any of those acts of misbehaviour which the recognizance was intended to prevent.

**GOOD Aller.** See ALLER.

**GOOD Behaviour.** See GOOD *abearing* and PEACE.

**GOOD Consideration.** See CONSIDERATION.

**GOOD Fortune, or PARA,** in *Geography*, an island in the East Indian sea, near the W. coast of Sumatra, about 36 miles long and six broad. S. lat.  $1^{\circ} 5'$ . E. long.  $98^{\circ} 30'$ .

**GOOD Taste.** See TASTE.

**GOODALORE,** in *Geography*, a town of Hindoostan, in the circar of Dindigul; 10 miles S. of Ootampaliam.

**GOODENIA,** in *Botany*, so named by the writer of the present article in honour of the Right Rev. Samuel Goodenough, lord bishop of Carlisle, F.R.S. and a vice-president of the Linnæan Society, author of a most valuable paper on British *Carices*, in the second volume of the Linn. Society's Transactions, and of one on British *Fuci*, in conjunction with Mr. Woodward, in the third. The name was constructed after the example of Tournefort, who, as he tells us, not without much consideration, contrived to form *Gundelia* out of *Gundelsheimer*. It did not occur to us at the time that *Goodenovia* might have come nearer to the original, and have been equally unexceptionable. It is now too late to make any such alteration. Linnæus named *Richardia* after Dr. *Richardson*, *Stillingia* after Mr. *Stillingfleet*, and these are sufficient precedents. Sm. Tr. of Linn. Soc. v. 2. 346. Brown. Prodr. Nov. Holl. v. 1. 574. Willd. Sp. Pl. v. 1. 954. Mart. Mill. Dict. v. 2. Clafs and order, *Pentandria Monogynia*. Nat. Ord. *Campanaceæ*, Linn. *Campanulaceæ*. Juss. *Goodenovicæ*, Brown.

**Gen. Ch.** Cal. Perianth superior, of five, nearly equal, linear leaves, permanent. Cor. of one petal, much longer than the calyx, irregular; tube slit from top to bottom at the back; limb of five deep, firm, lanceolate segments, with thin dilated longitudinal borders, turned most to one side, forming one lip, or generally two. Stam. Filaments five, shorter than the tube, often projecting through its fissure, capillary, equal; anthers vertical, oblong, of two lobes. Pist. Germen inferior, oblong, crowned with the calyx-leaves, which run down its sides and form ribs; style taper at the base, swelling upwards, undivided, nearly as long as the tube; stigma large, firm, obtuse, enveloped with a cup-shaped cover, more or less two-lipped, its margin fringed with dense upright hairs. Peric. Capsule oblong or elliptical, of two valves separating at the top, and two (rarely four) cells, the partition flat, parallel to the valves. Seeds numerous, imbricated, compressed.

**Ess. Ch.** Corolla of one petal, slit longitudinally at the back; limb in five deep segments turned one way. Anthers separate, beardless. Stigma with a cup-shaped fringed integument. Capsule inferior, of two or four cells, with a parallel partition. Seeds numerous, imbricated.

**Obs.** Mr. Brown has remarked, in some species, a small bag of honey attached to the germen, opposite to the fissure in the corolla.

Eight species of this very curious genus were originally defined in the Linnæan Society's Transactions, three of which, having been described without a knowledge of their fruit, are now, on more full examination, removed by Cavanilles and Brown to other genera. These are the *albida*, *striata*, and *ramosissima*; the latter, which, like the *albida*, is a *Scævola*, may be seen in Sm. Bot. of N. Holl. t. 5. The *striata* belongs to Mr. Brown's *Dampiera*. But on the other

hand the discoveries of this indefatigable collector and accurate botanist have increased *Goodenia* to 32 species, all natives of New Holland or of Van Diemen's land. Of these the first 28 have a two-lipped corolla, and the first 24 of them have yellow flowers, the rest blue or purple. Of the remaining four, two have a single-lipped corolla, and the others are doubtful in this respect, it being doubtful whether these last properly belong to the genus. One of them is *Selliera radicans*; Cavan. Ic. t. 474. f. 2. *Goodenia repens*; Billard. Nov. Holl. t. 76.

Satisfactory examples of the genus are,

*G. paniculata*. Sm. n. 2. Cavan. Ic. t. 507. This has yellow flowers in terminal panicles. Leaves mostly radica, strongly toothed. *Herbage* hairy.

*G. ovata*. Sm. n. 1. Cav. Ic. t. 506. Andr. Repof. t. 68. The first species that flowered in England, and from which the genus was described. This has rather shrubby stem, ovate neatly serrated smooth leaves, and axillary forked stalks, bearing elegant yellow flowers. It is a desirable ornament for a greenhouse, and not difficult of culture.

*G. grandiflora*. Sims in Curt. Mag. t. 890. Differs from the last in being downy, with lyrate leaves and larger flowers, whose tube is split into four segments, and singularly rough or bearded within.

*G. elongata*. Billard. Nov. Holl. t. 75. Is a very slender species, with long simple flower-stalks destitute of bractææ.

**GOODENOVIÆ,** a natural order of plants recently established by Mr. Brown, Prodr. Nov. Holl. v. 1. 573, being separated by him from the *Campanulaceæ* of Jussieu, and essentially distinguished by a peculiar cup-shaped integument, either undivided or two-lobed, which contains the stigma, and has hitherto been described by botanists as the stigma itself. See **CAMPANULACEÆ**.

Mr. Brown describes his new order as follows:

**Calyx** superior or half superior, rarely inferior, five-cleft, sometimes in five or three deep divisions, sometimes short, undivided, and occasionally obsolete; its segments equal, rarely unequal, permanent.

**Corolla** of one petal, more or less irregular, deciduous or withering. Tube split longitudinally, sometimes separable into five portions, while the calyx is merely attached to the base of the germen. Limb in five deep segments, composing one lip or two, their disk lanceolate, flat, their sides, or wings, of a thinner texture, elevated, folded inwards when young, rarely obsolete or deficient.

**Stamens** five, unconnected with either corolla or style, and alternate with the divisions of the former. Filaments distinct. Anthers either separate or cohering, linear, vertical, attached by their base, undivided, two-celled, the cells opening lengthwise. Pollen simple, rarely compound.

**Germen** of two or four cells, rarely of one only; the rudiments of the seeds either indefinite or definite, erect; sometimes bearing a gland between the two anterior filaments. Style one, simple, very rarely divided. Stigma fleshy, obtuse, either undivided or two-lobed, encompassed from beneath with a somewhat membranous, cup-shaped, entire or two-lobed integument, the great peculiarity of the order.

**Pericarp**, when the number of the seeds is indefinite, a capsule of two cells, rarely four, or sometimes, from the shortness of the partition, of scarcely more than one. Partition mostly parallel, rarely contrary, to the valves, which are either undivided or cloven, bearing the seeds or its midrib. When the number of the seeds is definite, one being in each cell, the pericarp is a drupa or a nut, rarely an *utrunculus* (or membranous undividing capsule), bearing the seed from its base.

**Seeds** often with a thickish coat, sometimes with a hard shell.

shell. Albumen fleshy, shaped like the seed, seldom wanting.

*Embryo* straight, about as long as the albumen. Cotyledons of a middling size, often leafy. Plumula inconspicuous.

These plants are either herbaceous or shrubby, not milky, chiefly found in the southern hemisphere, rarely within the northern tropic. Their pubescence when present is generally simple, sometimes glandular, rarely stellated. Leaves scattered, without stipulas, simple, mostly undivided, sometimes lobed, often toothed. Inflorescence terminal or axillary, various. Flowers distinct, very rarely aggregate, yellow, blue or purplish, seldom reddish.

The first section, with indefinite seeds, contains six genera; *Goodenia*, *Calogyne*, *Eutbales*, *Velleia* of Smith, *Lechenaultia* and *Anthotium*: the second, with definite seeds, three genera; *Scavola* of Linnaeus, much augmented, *Diapopsis* and *Dampiera*: the third section, with a single-seeded *utriculus*, is contrived to admit the *Brunonia*, named after the worthy and intelligent author, by Dr. Smith in the 10th volume of the Linnaean Society's Transactions not yet published. The place of this genus in a natural series is extremely difficult to determine. It agrees with the *Goodenoxia* chiefly in having an integument to the stigma, but in habit, aggregate flowers, four distinct bracteas, and some other marks, agrees with the *Dipsacae* of Jussieu, to which it is referred, not without doubt, in the Linnaean Transactions. It consists of two species, *Brunonia sericea*, and *australis*, herbaceous plants, with the aspect of simple-leaved *Scabiosa*.

GOODEROE, in *Geography*, a town of Abyssinia; 94 miles S. S. E. of Miné.

GOOD HOPE, or HOPE ISLAND, an island in the S. Pacific ocean, discovered by Le Maire and Schooten in 1616. The land is mountainous, not very high, and abounds with cocoa-nut trees; the coast affords no anchorage. S. lat. 16°. E. long. 174° 15'.—Also, the name of a Danish colony in West Greenland. N. lat. 64°.

GOOD HOPE, *Cape of*. See CAPE.

GOODIA, in *Botany*, in memory of Mr. Peter Good, an industrious gardener, employed in collecting seeds in New South Wales for the Kew garden. He died, some years since, in that remote country, and Mr. Brown has always been so sensible of his merits, that he has long destined a genus to his honour.—*Salis. Parad. Lond.* t. 41. Sims. in *Curt. Mag.* t. 958.—Class and order, *Diadelphica Decandria*. Nat. Ord. *Papilionaceae*, Linn. *Leguminosae*, Juss.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, somewhat bell-shaped; its upper lip with two, lower with three, longer and sharper, teeth. *Cor.* papilionaceous. Standard broad, inversely heart-shaped, erect. Wings horizontal, obovate, rather shorter. Keel nearly equal to the wings, abrupt, of two petals united in their lower part. *Stam.* Filaments ten, diadelphous, nine in one set, one distinct; anthers roundish. *Pist.* Germen stalked, ovate, compressed; style awl-shaped, ascending; stigma simple, obtuse. *Peric.* Legume stalked, ovate, compressed, of one cell, gibbous and flat at the back. *Seeds* two, roundish, compressed.

Esf. Ch. Calyx two-lipped; the upper cloven, broadest and shortest. Legume stalked, compressed, flat at the upper edge, of one cell.

Ohf. This genus, as Dr. Sims observes, ought to be placed next to *Bossia*, Tr. of Linn. Soc. v. 9. 302, from which it differs essentially in its legume, which has no dilated thickened edges, nor is it internally spongy nor many-celled. The stamens are truly diadelphous, in which it

differs from *Crotalaria*, as also in not having an inflated legume, though its habit comes nearest to that genus.

Two species are known.

1. *G. lotifolia*. *Curt. Mag.* t. 958.—Leaflets smooth, as well as the branches and flower-stalks.—Native of Van Diemen's land. One of the first New Holland plants raised in this country, and very hardy in the green-house, possibly able to bear our climate. Mr. Aiton favoured us with specimens from Kew in 1796. It is a delicate smooth shrub, with ternate somewhat glaucous leaves, and terminal clusters of numerous yellow flowers, the base of whose standard, and part of the wings, are stained with crimson, as in many New Holland flowers of this family. The legume is somewhat ovate, with a taper base, smooth, but marked with numerous, transverse, parallel, reticulated veins. One seed only is usually perfected.

2. *G. pubescens*. *Curt. Mag.* t. 1310.—Leaflets downy, as well as the branches and flower-stalks.—Very like the former, and brought from the same country. It flowered at Mr. Loddige's at Hackney. We think with Dr. Sims it has sufficiently the aspect of a distinct species, though its downiness, often a variable circumstance, affords the only specific character. The leaflets in the plate do not answer to his definition of obcordate, and we believe they vary in shape, as in many leguminous plants.

GOODIANELLI, in *Geography*, a town of Hindoostan, in Myfore; 19 miles N. of Seringapatam.

GOODIMANELLE, a town of Hindoostan, in Myfore; 20 miles W. of Bangalore.

GOODINGARY, a town of Hindoostan, in Timevelly, near the coast; 50 miles S. of Palamcotta.

GOODLUCK BAY, a small bay in the strait of Magellan, entirely surrounded by rocks. This bay supplies a little wood, and plenty of good water, but it is very difficult of access. S. lat. 53° 23'. W. long. 74° 33'. Variation two points easterly.

GOODNESS, in *Theology*, expresses one of the attributes of the Deity, sometimes denominated *Benevolence*. (See ATTRIBUTES and BENEVOLENCE.) Dr. Paley, in his "Natural Theology," illustrates and proves the divine goodness by two propositions, which may be evinced by observations drawn from the appearances of nature. The first of these propositions is, that in a vast plurality of instances in which contrivance is perceived, the design of the contrivance is beneficial. No productions of nature display contrivance so manifestly as the parts of animals, and all these parts have a real, and, with very few exceptions, a known and intelligible, subserviency to the use of the animal. Nor is the benevolent design of the creator abortive. The world, made with this design, is a happy world. The air, the earth, the water, teem with delighted existence. This argument is stated by the author in his "Moral Philosophy" in the following manner; "Contrivance proves design; and the predominant tendency of the contrivance indicates the disposition of the designer. The world abounds with contrivances, and all the contrivances which we are acquainted with are directed to beneficial purposes. Evil no doubt exists; but is never, that we can perceive, the object of contrivance. Teeth are contrived to eat, not to ache; their aching now and then is incidental to the contrivance, perhaps inseparable from it; or even, if you will, let it be called a defect in the contrivance; but it is not the object of it. This is a distinction which well deserves to be attended to. In describing implements of husbandry, you would hardly say of the sickle, that it is made to cut the reaper's hand, though, from the construction of the instrument, and the manner of using it, this mischief often follows. But if you had occasion to describe



describe the instruments of torture or execution, this engine, you would say, is to extend the sinews; this to dislocate the joints; this to break the bones; this to seorch the soles of the feet. Here pain and misery are the very objects of the contrivance. Now, nothing of this sort is to be found in the works of nature. We never discover a train of contrivance to bring about an evil purpose. No anatomist ever discovered a system of organization, calculated to produce pain and disease; or in explaining the parts of the human body, ever said, this is to irritate; this to inflame; this duct is to convey the gravel to the kidneys; this gland to secrete the humour which forms the gout; if by chance he come at a part of which he knows not the use, the most he can say is, that it is useless; no one ever suspects that it is put there to incommode, to annoy, or to torment."

Our author's second proposition is, "that the Deity has added *pleasure* to animal sensations, beyond what was necessary for any other purpose, or when the purpose, so far as it was necessary, might have been effected by the operation of pain." There is a class of properties, pertaining to animals, which may be said to be superadded from an intention expressly directed to happiness; an intention to give a happy existence distinct from the general intention of providing the means of existence, with which other capacities are connected; and that is, of capacities for pleasure, in cases, wherein, so far as the conservation of the individual, or of the species, is concerned, they were not wanted, or wherein the purpose might have been secured by the operation of pain. The provision which is made of a variety of objects, not necessary to life, and administering only to our pleasures; and the properties given to the necessities of life themselves, by which they contribute to pleasure as well as to preservation; shew a farther design than that of giving existence. This observation is illustrated by our ingenious author in a variety of familiar instances, deduced from the senses of taste, hearing, smell, and sight. The senses appear to be specific gifts, ministering not only to preservation, but to pleasure. But the senses, as they are usually called, are far from being the only vehicle of enjoyment, or the whole of our constitution, which is calculated for the purpose. We have many internal sensations of the most agreeable kind, hardly referable to any of the five senses. Besides these there are exercises of the understanding in volition, &c. of the imagination, and of other faculties of the mind, which furnish unmixed gratifications, without any counterbalancing pains. Whilst the above-stated propositions can be maintained, we are authorized to ascribe to the Deity the character of benevolence; and what is benevolence at all, must in him be *infinite* benevolence, by reason of the infinite, that is to say, the incalculably great, number of objects, upon which it is exercised. But besides the evidences of divine goodness that are furnished by a survey of the creation of the world, and especially of mankind; the same attribute is evinced in the providential government of the universe, and in the extraordinary means which the Deity has selected and pursued for meliorating the present condition of the human race, for recovering mankind from the degeneracy and misery that have prevailed in consequence of their own folly and vice, and for conducting them to the perfection of knowledge and virtue, and a happy immortality in a future world.

The character and undertaking of Jesus Christ, and all the benefits that result to mankind from his mission and mediation, reflect peculiar lustre on the benevolence of the Deity.

GOODOOR, in *Geography*, a town of Hindoostan, in Golconda; 35 miles S.E. of Warangole.—Also, a town of

Hindoostan, in the circar of Adoni; 15 miles NNE. of Condanore.

GOODS, in *Mining*, signify, in Derbyshire, the large and sizable lumps of lead ore, otherwise called *bing* or potter's ore.

GOONS, among public brewers, denote the malt or grains and liquor in their mash-tun.

GOONS, *bona*, in *Law*, and particularly the *Civil Law*, include all kinds of effects, riches, lands, possessions, &c. There are two kinds of goods; *moveable*, *res moventes*, or *mobiles*; and *immoveable*, called *res non moventes*, or *immobiles*.

It is a maxim in the civil jurisprudence, that he who confiscates the body, confiscates the goods; meaning, that all the effects of a person condemned to a capital punishment, or perpetual banishment, are forfeited to the king.

A man is said to bind himself body and goods; meaning, that besides his goods, he obliges his person, and submits to remain in prison, provided he do not execute his promise.

Goods, again, are divided into, 1. *Proper*, *paternal*, *patrimonial*, *hereditary*; 2. *Acquired* or *acquests*, *alio quam hereditatis jure acquisita*, and, 3. *Conquests*, *viro & uxori stante societate acquisita*.

Goods, again, are divided into *real* and *personal*. (See CHATELS and ESTATE.) And, lastly, into *noble* or *free*, and *servile* or *base*.

Goods belonging to the domain of the crown, *ad ffeum spectantia*, cannot be alienated for ever, unless it be done by way of exchange; they may be sold under the faculty of perpetual redemption.

Goods, *Adventitious*, *adventitia*, are those which arise otherwise than by succession from father or mother, or from direct ancestor to descendant. See ADVENTITIOUS.

Goods, *Dotal*, *dotalia*, those accruing from a dowry, and which the husband is not allowed to alienate. See DOWRY.

Goods, *Fugitives*. See FUGITIVE.

Goods, *Paraphernal*. See PARAPHERNALIA.

Goods, *Prohibited*. See PROHIBITED.

Goods, *Professions*, *professitia*, are those arising by direct succession.

Goods, *Receptitious*, were those which the wife might reserve the full property of to herself, and enjoy them independently of her husband; so called, in distinction from *dotal* and *paraphernal goods*.

Goods, *Vacant*, *vacantia*, are those abandoned, or left at large, either because the heir renounces them, or that the defunct has no heir. See BONA.

Goods, *Allotting of*. See ALLOTTING.

Goods, *Consignment of*. See CONSIGNMENT.

Goods, *Running of*. See RUNNING.

GOODWIN, JOHN, in *Biography*, a learned divine in the seventeenth century, who is said to have made more noise in the world than any other person of his age, rank, and profession. He was born in 1593, and received his academical education at Queen's college, Cambridge; and, immediately after he was admitted to orders, he was much admired for the erudition and elegance which distinguished his pulpit compositions. In 1633 he was inducted to the living of St. Stephen, Coleman street, London, from which he was ejected in 1645, because he refused to baptize the children of his parish promiscuously, and to administer the sacrament to his whole parish. He embraced the Arminian doctrines, and eagerly pleaded their cause in his sermons and writings; he adopted and maintained the independent form of church government;

government, and he was reckoned to be exceedingly skilful and courageous in attacking or repelling those who opposed him. His tenets were not those generally embraced, and at one period he is characterized as a man by himself; as being against every man, and having almost every man against him. He had a clear head, a fluent tongue, a penetrating spirit, and a marvellous faculty in defeating on scripture. In politics he was a decided and strenuous republican, and being eager in whatever he engaged, distinguished himself by his discourses and writings to promote, and afterwards to justify, the condemnation of the king. He lived, however, long enough to feel the weight of government directed against himself and his writings. He was obliged to abscond for a season, and one of his pieces was burnt by the common hangman, and in the same fire which executed its commission on the "Defensio pro populo Anglicano," by John Milton of immortal memory. The friends which his Arminian principles had procured him, found means to pacify the people in power, and to assure themselves that Goodwin should not be prosecuted for the part which he had taken in the late reign. He returned from solitude, and became minister of a private congregation in the neighbourhood of Coleman street, and, disapproving of the act of uniformity afterwards passed, continued a dissenter from the established church of the Independent denomination, till his death in 1665, in the seventy-second year of his age. His works, which are chiefly theological, are very numerous, among which the following may be mentioned; "Redemption Redeemed," in folio. "The divine Authority of the Scriptures," 4to. "An Exposition of the ninth Chapter of the Epistle of St. Paul to the Romans," 4to. Neal's Hist. of the Puritans, &c.

GOODWIN, THOMAS, who is styled by Anthony Wood "One of the Atlases and patriarchs of independency," was born in the year 1600 at Rolesby in Norfolk. Having received the elements of a grammatical learning, he was sent, when he was thirteen years old, to Christ-church college, Cambridge, where he applied himself with so much diligence to his studies, as to secure the esteem of his tutors, and to attract much notice in the university. In 1619 he was removed to Catherine Hall, of which he became a fellow. He soon shewed a decided inclination to the views and sentiments of those who were denominated Puritans, and taking them as his models, he prepared himself for the office of a Christian minister. It is not known when he took orders, but he was elected lecturer of Trinity church, in Cambridge, in the year 1628, and in 1632 he was presented by the king to the vicarage of the same church. In these employments he was greatly admired and followed by the Puritans, who began to look up to him as a leader, but becoming dissatisfied with the terms of conformity, he relinquished his preferments, and quitted the university in the year 1634. In 1639 he was selected as an object of persecution by the episcopal consistories, and to enjoy liberty of conscience he fled to Holland, where he was chosen pastor to an independent congregation at Arnheim. During the sittings of the Long Parliament he returned to London and became pastor of a church there, and also a member of the assembly of divines. His conduct, in their various meetings, and his zealous support of the Presbyterians, contributed to render him a favourite with Cromwell, through whose influence he was, in 1649, made one of the commissioners for the approbation of public preachers, and also appointed president of Magdalen college, Oxford. Here he formed a church upon the independent plan, and was exceedingly diligent in promoting the interests of learning and piety. His public

duties as a preacher did not prevent him from those studies which enabled him to become distinguished as a writer. He attended Cromwell upon his death-bed, and was overheard to express himself boldly and enthusiastically confident of the protector's recovery; and it is affirmed that when the event proved him mistaken, he exclaimed in a subsequent address to God "thou hast deceived us, and we are deceived." After the restoration he was dismissed from his presidency, when he retired to London, where, however, he was permitted to continue in the exercise of the ministry till his death in 1679, when he had attained to his eightieth year. He was a considerable scholar, and a learned and eminent divine. In the common register at Oxford he is described "in scriptis in re theologica quam plurimis Orbi notus." He was a high Calvinist, but while he zealously enforced what he conceived to be the doctrines of Christianity, he did not forget to enforce by every incitement in his power the necessity of pure moral conduct. He was author of numerous pious and controversial pieces, sermons, expositions, &c. some of which were printed during his life time, and inserted, after his death, in a collection of his works published in five volumes folio, which continue to be read and quoted by Calvinists of the present day. Neal's Hist. of Puritans, by Toulmir.

GOODWIN *Sands*, in *Geography*. See GODWIN *Sands*.

GOOGINGS, in *Sea Language*, are clamps of iron bolted on the stern-post of a ship, whereon to hang the rudder and keep it steady; for which purpose there is a hole in each of them, to receive a correspondent spindle bolted on the back of the rudder, which turns thereby as upon hinges.

GOOGOOS, in *Geography*, inhabitants of the inland territory of the island of Sumatra, covered with long hair, and little superior to the ourang outangs of Borneo. See SUMATRA.

GOOJINDERGUR, a town of Hindoostan, in Sanore; 25 miles N. N. W. of Sanore.

GOOL, a river of Hindoostan, which rises near Burawny, and runs into the Tapty, 8 miles S. of Chuprah.

GOOL, signifies a ditch or trench for water; called also a goit, gurt, leat, &c.

GOOLE, a breach in a sea-bank or wall; or a passage worn by the flux and reflux of the sea. Vide 16 and 17 Car. II. cap. 11.

The word comes from the French, *goulet*, the gullet or neck.

GOOLGUNGE, in *Geography*, a town of Hindoostan, in the circar of Chanderee; 25 miles E. of Chanderee.

GOOLLAH, a small circar or province of Bengal, situated E. of Coos-Beyhar.

GOOMAH, a town of Bengal, 45 miles N. of Ramgur. N. lat. 24° 23'. E. long. 85° 54'.—Also, a town of Hindoostan, in Bahar; 40 miles N. E. of Chittra.

GOOMBO, a town of Africa, in Bambarra. N. lat. 15° 3'. W. long. 5° 10'.

GOOMBOGANO, a town of Africa, in Kaffan. N. lat. 14° 20'. W. long. 8° 50'.

GOOMGONG, a town of Hindoostan, in Berar; 12 miles S. of Nagpour.

GOOMERPUN, a town of Hindoostan, in Oude; 16 miles S. W. of Azimgur.

GOOMPINGA, a town of Hindoostan, in Golconda; 20 miles N. E. of Culloor.

GOOMREPOUR, a town of Hindoostan, in Allahabad; 20 miles E. N. E. of Jionpour.

GOOMTY, a river of Asia, which rises in the mountains,

lands of Kamaoon, and crossing the country of Oude, joins the Ganges, about 15 miles N. of Benares.

**GOONANGAPY**, a small island in the East Indian sea, near the N. E. coast of Cumbaya. S. lat. 8° 10'. E. long. 119° 24'.

**GOONDWANAH**, the ancient name of the province of *Nazpou*, which see.—Also, mountains of Hindoostan, called "Kondouannah," situated in the S. E. part of the country of Malwa, extending from Huddigabad to Mundeilah, about 170 miles long. N. lat. 22° 40', to 23°. E. long. 78 to 81°.

**GOOPAMOW**, a town of Hindoostan, in Oude; 20 miles W. of Kairabad.

**GOOPIGUNGE**, a town of Hindoostan; 32 miles W. of Benares.—Also, a town of Hindoostan, in the foubah of Agra. N. lat. 26° 24'. E. long. 79° 18'.

**GOORACKPOUR**, a province of Oude, bounded on the N. by Thibet, on the E. by Bettiah and Sarun, on the S. by Gazypour, and on the W. by Oude proper and Bahraitch, about 60 miles long and 50 broad. The capital of the same name is situated 65 miles E. of Fyzabad. N. lat. 26° 44'. E. long. 83° 30'.

**GOORAH**, the name of two towns of Hindoostan; one in Oude and another in Allahabad.

**GOORUNTY**, a town of Hindoostan, in the circar of Cicacole; 17 miles S. W. of Ganjam.

**GOOS**, a town of Nubia. N. lat. 18°. E. long. 34° 18'.

**GOOSANDER**, in *Ornithology*. See *Meagus Merganser*.

**GOOSE, ANSER**, forms an order of birds in the Linnaean system. (See *ANSERES*.) The several species of geese belong to the genus of *anas* or *duck* under this order. See *Duck*.

**GOOSE**, a well-known bird, which, in many situations, may be highly beneficial to the farmer, as, where there are large waters and commons, and where the stubbles are abundant. It is valuable both for its flesh, fat, and feathers.

The varieties of geese are numerous, but the large common kinds are probably the best for the uses of the farmer.

**GOOSE, Ember**. See *COLYMBUS Immer*.

**GOOSE, Soland or Solan**, sometimes called *gannet*, the English name of a large water-fowl, called by authors *Anser Bassanus*, and by Linnaeus *PELECANUS Bassanus*, which see.

**GOOSE Creek**, in *Geography*, a river of New Jersey, which runs into the Atlantic, N. lat. 39° 53'. W. long. 74° 16'.—Also, a river of Kentucky, which runs into the Ohio, N. lat. 38° 10'. W. long. 86° 3'.—Also, a river of North Carolina, which runs into the Atlantic, N. lat. 34° 40'. W. long. 77° 21'.—Also, a river which falls into the Potowmac, about a mile S. E. of Thorpe, in Fairfax county, Virginia.

**GOOSE-dung**, in *Agriculture and Medicine*. See *DUNG* and *CHENOCOPRUS*.

**GOOSE-foot, or Wild Orach, or Good Henry**, in *Botany*. See *CHENOPodium*.

**GOOSE-grass**, the common name of a troublesome weed that is frequently met with on clayey soils. It is best destroyed by cutting it in the summer, and keeping the land under the plough in good condition. See *GALIUM Aparine*.

**GOOSE-grass, Great**. See *ASPERUGO*.

**GOOSE Island**, in *Geography*, a small island in the gulf of St. Lawrence, near the coast of Labrador. N. lat. 50° 52'.

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W. long. 59° 10'.—Also, a small island in Christmas Sound, on the coast of Terra del Fuego.

**GOOSE Lake**, a lake of North America. N. lat. 52° 55'. W. long. 94° 45'.—Also, a lake of North America. N. lat. 54° 30'. W. long. 101° 21'.

**GOOSE-neck**, in *Sea Language*, is a sort of iron hook fitted on the inner end of a boom, and introduced into a clamp of iron or eye-bolt, which encircles the mast, or is fitted to some other place in the ship, so that it may be unhooked at pleasure.

**GOOSE River**, in *Geography*, a river of America, which runs into the Mississippi. N. lat. 43° 14'. W. long. 93° 56'.—Also, a river of South Carolina, which runs into Cooper's river. N. lat. 33° 2'. W. long. 79° 57'.

**GOOSE-wings of a sail**, in *Sea Language*, denote the clus or lower corners of a ship's main-sail, or fore-sail, when the middle part is furled or tied up to the yard.

**GOOSE-wing**, at *Sea*, a certain manner of fitting a sail, which is thus performed: when a ship sails before a wind, or with a quarter-wind, and in a fresh gale, the seamen sometimes, to make the more haste, unparal the mizen-yard, and then they launch out both sail and yard over the quarter on the lee-side, fitting guyes at the farther end, to keep the yard steady with the boom, and this booms out the mizen-sheet. This they do to give the ship the more way, which otherwise, with these winds, the mizen-sail could not do; and this sail, so fitted, is called a *goose-wing*, and sometimes a *studding-sail*.

**GOOSEBERRY Bush**, *Grossularia*, in *Botany*, is a species of the *ribes* in the Linnaean system. See *RISES*.

The gooseberry-bush is propagated either by suckers or cuttings, but the latter way is preferable, as the roots are less subject to shoot out suckers afterwards.

The best season for planting the cuttings is in autumn, just before the leaves begin to fall; observing always to take the handsoonest shoots, and to pick them from such branches as produce the greatest quantity of fruit. The cuttings should be about six or eight inches long, and should be planted in a bed of light earth exposed to the morning sun; they must be planted about three inches deep, and watered to help their taking root. The shoots should be rubbed off from these plants as they put out, except those at the top, that there may be a regular stem. In the October following, they should be removed to a bed of fine light earth, and planted in rows at three feet distance, and one foot asunder in the rows. They should remain here one year, and the cross branches at times be cut off, as also the lower ones, so as to keep a clean stem about a foot above the ground. They will be then fit to plant out where they are to stand, which should be in a light sandy loam. They should be kept from the shade of other trees; and to have the fruit in its utmost perfection, should be set in an exposed place in rows of eight feet asunder, and each of the shrubs six feet from the others in the rows. The best time for transplanting them is in October, when the leaves begin to decay. Miller.

**GOOSEBERRY**, in *Agriculture*, is a plant that may sometimes be employed in the forming of hedge-fences, especially that sort known in the North by the title of Iron-monger.

**GOOSEBERRY Caterpillar**, in *Gardening*, the common name of a very destructive insect to the gooseberry and some other plants. Many different methods of destroying it have been proposed, but with little success.

**GOOSEBERRY of Barlabbas**. See *CACTUS*.

**GOOSEBERRY Tree**. See *MELASTOMA*.

**GOOSEBERRY-galls**, in *Natural History*, the name given by

authors to a species of protuberances of the gall kind, found very frequently on the oak. They are of a roundish figure, and sometimes adhere to the tree by a short pedicle, but more frequently by a part of their spheric surface. They are usually found on the under side of the leaves of the oak, but sometimes on the young shoots, and sometimes on the pedicles of the leaves.

They are most frequent in spring, but they are found at all times when the leaves are upon the trees. These galls are greenish at first, and afterwards become yellowish, and finally red; in which last state they very much resemble the small red gooseberry. They are very soft to the touch, and when opened are found to contain a juicy substance, with a cavity in the midst, in which there is lodged a single insect. This, according to the time in which the gall is opened, is found in the form of a white worm, or else of a white chrysalis, or finally of a small short-bodied four-winged fly of a black colour; for the creature does not leave the gall to go through any of its changes, but passes all its states in it. The gall, in all these cases, is found whole and unhurt; but if one is opened in which there is a hole pierced, this is sure to be found empty, that being the passage by which the fly has made its way out. Reaum. Hist. Inf. vol. vi. p. 214.

GOOSEBERRY *Islands*, in *Geography*, small islands near the E. coast of Newfoundland; 24 miles N.W. of Cape Bonavista.

GOOSEBERRY *Rocks*, dangerous rocks lying on the coast of Essex county, in the state of Massachusetts.

GOOTA, a town of Hindoostan, in Goondwanah; 10 miles S. of Nagpour.

GOOTOKA, a town of Hindoostan, in the circar of Ruttunpour; 5 miles S. of Ruttunpour.

GOOTY, or GURTI, a town and fortress of Hindoostan, the capital of a district in Myfore; 170 miles N. of Seringapatam. It is situated on a hill beyond the river Pennar, or Pen-aur, and towards Adoni; and was formerly the seat of government of a Mahratta prince; but at the death of Tippoo, the town and district were assigned to the Nizam. N. lat. 15° 15'. E. long. 77° 48'.

GO-OUT, in *Mining*, is sometimes used to express the appearance of the edge of a stratum at the surface; otherwise called the basket, crop, out-going, or out-burrit of that stratum; and such strata are said to go-out, burrit-out, run-out, head-out, want-cover, &c.

When the ore in a vein suddenly ends in the deads or gangue, it is said to go-out; also, when a stratum of coals ends abruptly against a fault, or wall of gravel filling a fault, or basket under a heap of gravel, as is not uncommon in the south of Derbyshire, it is said to go-out, and so of the irregular or feather-edge masses which are sometimes met with in the strata accidentally, or without being continuous like all the regular strata, however thin.

GOPALCHITTY, in *Geography*, a town of Hindoostan, in Coimbatore; 18 miles N.W. of Erroad.

GOPALGUNGE, a town of Bootan; 58 miles N. of Dinagepour.

GOPALNAGUR, the name of two towns in Bengal; one 25 miles S.S.E. of Kishenagur, and another 30 miles E.S.E. of Dacca.

GOPALPOUR, the name of several towns in Hindoostan, one 8 miles N. of Hurdah, a second, 12 miles N. of Goragot, a third, 15 miles N. of Gurrab, a fourth, 23 miles S. of Bahar, a fifth, 20 miles N.W. of Narva, a sixth, 20 miles S. of Goorackpour, a seventh, 38 miles S. of Fyzabad, an eighth, 25 miles N. of Amedabad.

GOPALDROOG, a fortress of Myfore; 36 miles E. of Seringapatam.

GOPAULGUNGE; a town of Bengal. N. lat. 23° 2'. E. long. 89° 56'.

GOPAULNAGUR, a town of Bengal, 42 miles S. of Burdwan. N. lat. 22° 31'. E. long. 88°.

GOPEER, a town of Bengal; 15 miles E.N.E. of Ramgur.

GOPERAPILLY, a town of Golconda; 20 miles E.S.E. of Hyderabad.

GOPHNA, GOPHITH, or *Gaphna*, in *Ancient Geography*, a town of Palestine, and chief place of one of the ten toparchies of Judah. Eusebius places it fifteen miles from Jerusalem, towards Sichen.

GOPLO, in *Geography*, a lake of Poland, in the palatinate of Brzesc, 16 miles long, and four wide.

GOPPINGEN, a town of the kingdom of Wurtemberg, situated on the Vils, in a fertile country, having considerable woollen manufactures, and near it a medicinal spring; 20 miles N.N.W. of Ulm. N. lat. 48° 47'. E. long. 9° 41'.

GOR, a town of Persia, in the province of Farfistan; 57 miles N.W. of Schiras.—Also, a town of Italy, in the department of the Mela; 8 miles S. of Brechia.

GOR, a name given by some writers to a very lofty tree, which bears a fruit like the chestnut; it grows principally on the banks of the river Niger, and that not near the sea, but far up the country.

GOR-cock, in *Ornithology*, the name of a bird of the gallinaceous kind, called by authors the lagopus altera, and by many the moor-cock, or red game; it is of the shape of the partridge, but is half as large again. See GROUSE and *TETRAO Lagopus*.

GORA, in *Geography*, a town of Hindoostan, in the circar of Chandail; 20 miles W. of Saipour.

GORACALLY, a town of Bengal; 12 miles S.S.W. of Mahmudpour.

GORAGOT, a province of Bengal, bounded on the N. by Rungpour, on the E. by Radjoohow, Patladah, and Islamabad, on the S. by Bettoriah and Pargunnah, and on the W. by Dinagepour; about 55 miles long, and from 12 to 30 broad. Its capital, Goragot, is distant 80 miles N.N.E. from Moorshedabad. N. lat. 25° 14'. E. long. 89° 22'.

GORAI, a town of Poland, in Galicia.

GORAM, a small island, being one of the Moluccas, in the East Indian sea, S.E. of Ceram; reputed the most eastern boundary of Mahometanism. It has thirteen mosks. S. lat. 3° 42'. E. long. 121° 36'.

GORANTO, a town of Asiatic Turkey, in Caramania; 80 miles S.W. of Satalia.

GORAPARI, a town of Brazil, at the mouth of a river of the same name, which runs into the Atlantic. S. lat. 20° 40'.

GORBARA, a town of Corsica; 8 miles N.E. of Calvi.

CORBATA, a town of Africa, in Biledulgerid, anciently "Orbita;" 12 miles S.W. of Gaf-a.

GORBATOV, a town of Russia, in the government of Niznei Novogorod. N. lat. 56° 5'. E. long. 43° 14'.

GORCA. See GORKAH.

GORCE, or GOURT, denotes a weir. By stat. 25 Edw. III. cap. 4. it is ordained, that all gorges, mills, weirs, &c. levied or set up, whereby the king's ships and boats are disturbed, and cannot pass in any river, shall be utterly pulled down, without being renewed. Sir Edward Coke derives this word from *gorges*, a deep pit of water, and calls it

it a *gors*, or *gulf*; but this seems to be a mistake, for in *Doomsday* it is called *gourt* and *gart*, the old French word for a *coveir*.

**GORCHWICH**, in *Geography*, a town of Saxony, in the Vogtland, 18 miles S.S.W. of Gera. N. lat. 50° 22'. E. long. 11° 53'.

**GORCUM**, probably a corruption of *Gorickum*, a town of Holland, situated on the river Linge, at its union with the Wahal. From the steeple of the principal church may be seen 22 walled cities, besides a great number of towns and villages; before the revolution it had one parish-church, and three religious houses; 12 miles E. of Dort. N. lat. 51° 52'. E. long. 4° 50'.

**GORDENE'**, in *Ancient Geography*, a country of the Greater Armenia, according to Ptolemy; which country is called "Gordyené" by Strabo and by Plutarch in his life of Lucullus.

**GORDES**, in *Geography*, a town of France, in the department of Vaucluse, and chief place of a canton in the district of Apt; 9 miles W. of Apt. The place contains 2812, and the canton 6430 inhabitants, on a territory of 167½ kilometres, in 8 communes.

**GORDEWARE POINT**, a cape of Hindoostan, on the coast of Rajamundry, at the mouth of the Godavery. N. lat. 16° 42'. E. long. 82° 23'.

**GORDIÆUS Mons**, in *Ancient Geography*, a mountain of the Greater Armenia. Ptol.

**GORDIANI, M. ANTONIUS GORDIANUS**, in *Biography*, Roman emperor, born A.D. 157, was son of Metius Marullus, a senator descended from the Gracchi, by Ulpia Gordiana, of the family of the emperor Trajan. He became possessed of a great estate, with which he lived in a style of magnificence, but without passing the bounds of moderation. He was a patron of literature and literary men, and a proficient in eloquence and poetry. He wrote a poem in thirty books, to celebrate the reigns of Titus and M. Aurelius Antoninus. When he served the office of edile, he entertained the people with a splendour which no private person had for a long time exhibited, and his shows were exhibited every month in the year while he was in office. There is, however, no reason for supposing that he was over ambitious of coming forwards into public life, for it was not till his fifty-fifth year that he was elected consul in conjunction with the emperor Caracalla. He might, perhaps, be unwilling to risque the safety of his person in those turbulent times; and it has been thought extraordinary that under so jealous a tyrant he should venture upon the profuse expences which distinguished his consulship not only in the imperial city, but in various parts of Italy also. He enjoyed the same honour a second time in the reign of Alexander Severus, who expressed his high esteem for him by confirming his nomination to the government of Africa as proconsul. In this important post he displayed so much equity and beneficence, that he was more beloved in the province than any of his predecessors. Under the emperor Maximin, in the year 237, a sedition was excited against the rapacity of an officer in the government of Africa, and the perpetrators, to avoid the vengeance of a cruel and incensed sovereign, appeared in open rebellion and insisted upon Gordian's assuming the purple. He remonstrated with the conspirators, but their resolution was formed, and at the age of fourscore he was forced to appear in a character, after which he had never aspired. They associated with him, to alleviate his cares, the younger Gordian, a man of voluptuous habits, but who was of a mild disposition, and attached to letters. A library of sixty-thou-

sand volumes, bequeathed him by his tutor Serenus Samocrenus, gave him reputation in the literary world, which he maintained by writing both in prose and verse. This young man had been elevated to the office of quaestor by the detestable Heliogabalus; nevertheless, the confidence placed in his integrity, and knowledge of the laws, by Alexander, who created him prefect of Rome, and who always paid great deference to his advice, was much in his praise. He shared in the elevation of his father, and they were declared joint emperors. The Gordians removed to Carthage, where they sent letters to Rome, announcing their election. Maximin was at that time absent, and the senate willingly sanctioned the choice of the Africans, and declared Maximin a public enemy. In the mean time, a change took place in Africa, which annulled all their projects. Capellanus, governor of Mauritania, who had been always upon ill terms with Gordian, assembled a body of veterans, declared for the reigning emperor, and marched to Carthage. The younger Gordian fell out to oppose him with his guards, but he was soon defeated and slain. Capellanus entered the city, which so much alarmed the elder Gordian, that to prevent his falling into the hands of his enemy, he strangled himself in his apartment with his girdle. This event happened in June 237, and within a few weeks of his assuming the office of emperor. Gibbon.

**GORDIAN III.** Roman emperor, grandson of the elder Gordian, was but thirteen years old when he was chosen emperor, in connection with Maximus and Balbinus. He was created Caesar, and assumed the family name. His two colleagues were in a few months murdered by the Fructerian bands, and the youthful Gordian remained sole emperor. His person and manners excited universal favour, and the senate, people, and army united in giving him the endearing appellation of their son. In the commencement of his reign he was governed by his mother's counsels, who abated his authority, and set the honours and offices of the empire up to sale. He was, however, happily rescued from this disgraceful condition by Mithreus, a man of learning, to whom he was also indebted for literary instruction and advice. In the year 241 he married the daughter of Mithreus; and raising his father-in-law to the post of prefect-prætor, committed to him the principal direction of public affairs. He proved himself worthy of the important trust confided in him, and discharged the duties of a statesman and general, as well as he had maintained those of a more private station. By his persuasion, the young emperor accompanied him in 242, in an expedition to the East, for the purpose of repelling an invasion from Sapor king of Persia. Under his guidance, Gordian relieved Antioch, crossed the Euphrates, defeated Sapor, and recovered the whole of Mesopotamia. The young emperor did not assume the glory of the deeds, but in a letter to the senate, announcing the successes, he modestly ascribes them to the conduct, the experience, and valour of Mithreus, who shortly after died. During the whole expedition Mithreus had watched over the safety and discipline of the army, while he prevented their murmurs by maintaining a regular plenty in the camp, and by establishing great magazines of vinegar, bacon, straw, barley and wheat in all the cities of the frontiers. The prosperity of the emperor expired with Mithreus; he was succeeded in the office of prefect by Philip, an Arab by birth, and consequently, says Gibbon, in the earlier part of his life, a robber by profession. He was a man of considerable military talents, but impetuous, and destitute of true moral principles. His energy and boldness prompted him to assure to the troops, and his abilities were employed to supplicate, not to punish indulgent mailer. By his art-difficulties were formed among

the troops, which induced them to demand that his minister Philip should be associated with Gordian as partner in the empire. This was not sufficient to satisfy his ambitious views; the young emperor was sacrificed at his instigation; he was put to death near the banks of the Euphrates, in March 244, after a reign of five years and eight months. A sepulchral monument was erected to his memory on the spot where he was killed. Gibbon.

**GORDIAN**, a term in *Hystory*. Gordian knot was a knot made in the leathers or harness of the chariot of Gordius, king of Phrygia, and father of Midas; so very intricate, that there was no finding where it began or ended.

The inhabitants had a tradition, that the oracle had declared, that he should be master of Asia who could untie this knot. Alexander having undertaken it, and fearing that, if he should not be able to effect it, it would be deemed an ill augury, and prove a check in the way of his conquests, cut it asunder with his sword; and thus, say Quintus Curtius, either accomplished the oracle, or eluded it. But Arillobulus gives a different account of this matter. See Arrian, lib. iii. cap. 20. and Plut. in Vit. Alex.

Some will have the phrase derived from Gordius who tied the fatal knot; others from Gordium, a city in Phrygia, where the knot was made.

**GORDIUM**, in *Geography*, a town of Asia, in Phrygia, situated on the river Sangar; afterwards called Juliodolis.

**GORDIUS**, in *Zoology*, a genus of Vermes, the essential character of which consists in the body being round, filiform, naked or smooth, and of equal thickness throughout.

Linnæus, and after his example the French naturalist Bruguière, has placed the animals of this genus among the intestinal vermes, an order of beings to which, from their general structure, they seem to bear no very remote alliance; and this similarity is still more strongly evinced in the habits of those species which occasionally penetrate into the flesh of men and animals, and therein for a while derive their sustenance from the blood and other fluids. Notwithstanding this analogy, under such circumstances we cannot but agree with Lamarek that it is impossible to consider them as internal vermes with propriety, since they only occasionally reside in the bodies of animals as before mentioned, and in their habits and manners of life at other periods differ most essentially: they are literally aquatic animals, with carnivorous appetites; though for a certain length of time they can subsist like the true intestinal vermes, when by any accidental circumstance they happen to insinuate themselves into the flesh of a living animal.

At the head of this tribe we may justly place the species *medicinis*, or hair worm of the Indies, a pernicious creature, referred to the genus Gordius by Linnæus in the latest edition of his Syst. Nat., but from which it was afterwards removed by his editor Gmelin to that of Filaria. This removal we deem unnecessary, and under this persuasion wish to restore the species to its former situation in the genus Gordius.

#### Species.

**MEDINENSIS.** Body entirely pale. Linn. Sloane Jam. &c.

This very remarkable creature is often from ten to twelve or even fifteen feet in length, and in thickness not exceeding a horse-hair. It is well known by its disastrous effects as an inhabitant of both the Indies, where it lives in marshy places, and is frequently observed on the ground in the morning dew. In this situation it easily creeps up, and entwines itself round the naked legs of the negro slaves, or

animals, and penetrating the skin, buries itself speedily in the flesh, where it causes the most violent pains, accompanied with troublesome itchings, and oftentimes inflammation and fever. The most certain means of extricating the worm is to make an incision in the part of the flesh at which its entrance was effected, so as to obtain secure hold of either of the extremities, or the head if possible, and this being made fast to a small stick by means of a piece of silk, the animal may be gradually drawn out of the wound by turning the stick round a little each day. The utmost circumspection is requisite in performing this operation, for if by being too much strained the worm should break, the part remaining within the flesh grows with increased vigour, gangrene appears almost immediately, and death itself ensues very shortly.

**AQUATICUS.** Pale brown, with blackish extremities. Linn. *Gordius seta*, Müll. *Vitulus aquaticus*, Gess. Meerwurm, Jontl. *Chetin*, Hill &c.

This fo entirely resembles a hair of from four to six inches in length, that except by its motions it could be in no manner distinguished from a substance of that kind by the casual observer; its internal structure is equally remarkable also for its simplicity, consisting merely, as it appears, of a canal extending from one end to the other, and both the mouth and vent are the most simple possible, since a small vent constitutes the first, and a groove or hollow the latter. Its ordinary places of residence are stagnant waters, in pools and ditches, or in very tranquil rivers, as the agitation of turbulent waters would destroy its tender frame. During winter it remains buried deep in the clay, from whence it emerges in spring, and is found in the water during the summer months, where it is frequently observed, and from its appearance is vulgarly imagined to be the offspring of *horse hair* dropped by accident into the water. It twills itself into various contortions; and it is affirmed that its bite will occasion the complaint called a whitlow. A fact still more extraordinary, and which appears in some measure to be authenticated with tolerable accuracy, is the retentive power of animation, which this creature possesses in a very superior degree, though not by any means to the extent that certain naturalists conceive. Some writers affirm, indeed, that it has been known to recover the free exercise of its vital functions upon being steeped for a short space of time in water, after having remained in a dried state for weeks, months, and even years, and when of course it might be naturally conceived the most latent spark of life must be extinct. If these latter assurances have not arisen from the result of some very superficial experiments, they are at least to be received with caution, since their observers seem to believe that these animals partook also in some measure of the reproductive properties of the polype, and which more recent observations prove to be erroneous; we cannot, therefore, upon the whole, avoid concluding that although the animals of this kind are extremely tenacious of life, there is no foundation in truth for the very extraordinary assertions above related.

**ARGILLACEUS.** Body uniformly yellowish. Linn.

Very much resembles the last, and like that species is found in the clay at the bottom of stagnant waters.

**FILUM.** Body filiform and whitish. Müll.

Extremely slender, tapering at one end, and hyaline. Found in the bark of old wooden pipes which had been placed in the ground for the conveyance of water.

**LACTEUS.** Body uniformly white and opaque. Müll.

Occurs in myriads in stagnant water from the month of July till September. When touched, this species contracts itself in a moment, and then again expands immediately.

**ARENARIUS.** Fulvous and obtuse. Müll.



Inhabits the bottom of Christians bay, in Norway.

GORDON, BERNARD, in *Biography*, a French physician of the thirteenth century, is said to have conferred honour on the medical faculty of Montpellier, where he began to teach in the year 1205. As was the custom of the time, he took his surname from the place of his birth, (Gordon in Rouvergne,) and called himself Bernardus de Gordonio, and not Gordonus, as it is commonly written. According to the accounts of some writers, who place the death of this physician in 1305, he taught at Montpellier only twenty years; but Renchin affirms, that he was living in 1318. He left a considerable number of treatises, which were published together at Ferrara in 1487, at Venice in 1494, at Paris in 1542, and at Lyons in 1550. Eloy. Dict. Hist.

GORDON, MR., in the year 1744 played the first violin in Drury-lane play-house. He was a young man, born in Norfolk, who had travelled to Italy for improvement. He was very near-sighted, and always played in spectacles. He succeeded Charke, had a strong hand, good tone, and was well fitted to his station. He generally played a concerto in the second music, as was then the practice, which was very attractive. He was brother to the subject of the following article.

GORDON, ———, an eminent performer on the violoncello, the son of a clergyman in Norfolk, and many years the first violoncello at the opera. He was remarkable for the fullness of his tone, and perfect execution of whatever he undertook, though far surpassed by subsequent players in the use of the bow, and knowledge of the finger-board. He lived respectably, had many powerful friends, and realised a competence by his profession.

In 1765, Messrs. Gordon, Vincent, and Crawford, undertook the opera regency in the Haymarket. The two first were experienced professors, and the third had been many years treasurer under different managers. Gordon, an excellent performer on the violoncello; and Vincent, a scholar of the celebrated Martini, long a favourite on the hautbois. His father was a bassoon player in the Guards, and his brother, James Vincent, who died young, was joint organist of the Temple with Stanley, and a brilliant performer. Mr. T. Vincent, the impresario, had been in great favour with the late prince of Wales, father to his present majesty; had acquired a considerable sum of money in his profession, which he augmented by marriage. However, the ambition of command, though of so forward a family as an opera, vocal, and instrumental band, turned his head and his purse inside out; in short, he soon became a bankrupt, sculked in indigence during the rest of his life; and his colleagues, though they escaped utter ruin, were not enriched by the connection.

GORDON, ALEXANDER, a learned writer of the eighteenth century, was a native of Scotland. He was well acquainted with the Greek and Latin languages, and being a good draughtsman, he was enabled to derive peculiar advantages from a long residence in Italy, and from his travels in other parts of Europe. He was engaged as secretary to the society for the encouragement of learning; and to the Egyptian club, and to the Antiquarian society. He afterwards accompanied governor Glen to Carolina, where he occupied various posts in the province, and received a handsome grant of land. Here he died, leaving a good estate to his family. He was author of "Itinerarium Septentrionale," or a journey through most parts of Scotland, illustrated with copper plates. This was published in 1726, and in 1732 he gave additions and corrections to it, containing an account of Rerum antiquities in Scotland, and ancient monuments in the north of England. He wrote likewise "The Lives of

Pope Alexander VI., and his Son Carlos I. &c." "A complete History of ancient Amphitheatres, translated from the Italian." "An Essay towards explaining the hieroglyphical Figures on the Coffin of a Mummy." "Twenty-five Plates of all the Egyptian Mummies in England, and other Egyptian Antiquities." Gen. Biog.

GORDON, ANDREW, was born in 1712 near Aberdeen. He was sent to Ratisbon, where he applied himself to polite literature. In 1731 he made a tour through Austria, Italy, and France, and on his return in the following year entered into the order of the Benedictines in the Scots monastery, where he applied to philosophy, and was ordained priest. In 1735, he went to Salzburg to study the law, and he attended the theological lectures till he was invited, in 1737, to be professor of philosophy at Erfurt. His discoveries in electricity made his name known to the philosophers in Holland, France, Italy, and England, and he is mentioned by Dr. Priestley as the first person who used a cylinder instead of a globe in electric experiments. His first work on this subject was entitled "Phenomena Electricitatis Explicata," 1744; and in the following year he published in 3 vols. 8vo. "Philosophia utilis et jucunda." He was author of an "Impartial Account of the Origin of the present War in Great Britain," and of "Physice Experimentalis Elementa." Gen. Biog.

GORDON, JAMES, a Scotch Jesuit, was born in the year 1543. He left his native country, and went to Rome, where he entered the society of Jesus, in 1563. He became distinguished for deep and extensive learning, and was sent on religious missions into Germany, Denmark, and the British isles, where he is said to have suffered much on account of his attachment to the Catholic faith. He died at Paris in 1620. Leaving behind him a work in two volumes 8vo. entitled "Conroversiarum Christianæ Fidei Epitome."

There was another Scotch Jesuit of the same name, and contemporary with the above, who wrote a commentary on the whole bible, which he published at Paris, in three volumes folio, under the title of "Biblia sacra, cum Commentariis ad usum Literæ, et explicatione Temporum, Locorum, Rerumque omnium que in sacris Codicibus habent obscuritatem: una cum Textu Librico." This work is well spoken of by Dupin. He was author likewise of a work on Chronology; and of "A System of moral Theology." &c. Moreri.

GORDON, THOMAS, a native of Kirkcubright, in Scotland, after having received an academical education in his own country, came to London, and maintained himself by teaching the learned languages. His talents were made known to people of consequence, and he was employed by the earl of Oxford in queen Anne's reign as a political writer. He wrote in defence of bishop Broadley in the Bangorian controversy, and became the assiduous and partner of Mr. Trenchard, in his literary undertakings. They published, in conjunction, a series of papers, entitled "Cato's Letters;" and the "Independent Whig," which Mr. Gordon continued alone after the death of Trenchard. When this event took place, sir Robert Walpole engaged Gordon as one of the writers in defence of his measure, and procured him a place, which he held as long as he lived. Mr. Gordon made himself known by translations of Tacitus and Sallust, as well as by his political pieces. To these translations he prefixed discourses relative to subjects of each original author. He died in 1750, at the age of sixty-six. Some of his posthumous tracts appeared in two works, entitled "A Cordial for Low Spirits;" and "The Pillars of Priestcraft and Orthodoxy shaken." He was a distinguished writer in favour of civil and religious liberty, and is highly

effected by the friends of freedom for the manly spirit with which he supported its cause against tyranny of every kind. Gen. Biog.

GORDONA, in *Geography*, a town of Naples, in the county of Molise; six miles S.W. of Molise.

GORDONIA, in *Botany*, named by Mr. Ellis, in the Philosophical Transactions for 1770, in honour of Mr. James Gordon, an eminent nurseryman at Mile-end, near London, who introduced many new plants to the knowledge of the curious, or rather cultivated with great skill and success such as were communicated to him, from various quarters, by the collectors and naturalists of that day, among whom were Bartram, Collinson, Ellis, and many others. He was a frequent correspondent of Linnæus, and sent him several living plants, especially of North American origin. Linn. Mant. 556. Syst. Nat. ed. 14. 631. Schreb. 471. Willd. Sp. Pl. v. 3. 840. L'Herit. Stirp. Nov. 156. Cavan. Diff. fasc. 6. 307. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 2. 231. Juss. 275. Lamarek. Illustr. t. 594. Dict. v. 2. 770. Class and order, *Monadelphia Polyandria*. Nat. Ord. *Columnifera*, Linn. *Malvaceæ*, Juss.

Gen. Ch. *Cal.* Perianth simple, inferior, of five roundish, concave leaves. *Cor.* Petals five, large, obovate, or obovate, concave, cohering at their base, somewhat unequal. *Stam.* Filaments very numerous, thread-shaped, united at their base into a thick cup-shaped body; anthers oval, erect. *Pist.* Germen superior, ovate or nearly globose; style short, columnar, obscurely five-sided, sometimes five-cleft; stigmas five, acute, horizontal. *Peric.* Capsule ovate or globular, of five cells and five valves, the partitions from the middle of the valves, which are deeply cleft at their base. *Seeds* in two rows in each cell, angular, winged, inserted into a five-angled central column.

Eff. Ch. Calyx simple. Style columnar. Stigma five-cleft. Capsule of five cells. Seeds several, in two rows, winged.

1. *G. Lasianthus*. Linn. Mant. 570. Curt. Mag. t. 668. Cavan. Diff. t. 161. (*Hypericum Lasianthus*; Linn. Sp. Pl. 1101. *Alcea floridana quinquecapularis*, &c.; Pluk. Amalth. t. 352. f. 3.) Loblolly Bay.—Flower-stalks elongated. Leaves coriaceous, smooth. Capsules ovate.—Native of swamps in South Carolina, where it forms a very handsome tree, but is with great difficulty cultivated in England. It blooms in August and September. We have seen this plant flowering in great perfection at Kew 25 years ago. The leaves are scattered, on short stalks, elliptic-lanceolate, three to five inches long, bluntish, with numerous shallow serratures, veiny, smooth on both sides, of a fine shining green, like those of *Prunus Lauro-cerasus* above, paler beneath. *Stipulas* none. *Flowers* solitary, on simple axillary stalks, thrice as long as the footstalks, as large as a moderate rose, white with yellow stamens, very handsome but inodorous. A pair of deciduous fringed bractæas, a little below the flower, are called by Cavanilles an outer calyx. Authors have differed about the class of this plant in the Linnæan system, the filaments cohering imperfectly and irregularly together in parcels, besides being connected by one common fleshy base. If this base be called a nectary, for which there is no good reason, the flower is polyadelphous, but we think, with Dr. Sims, and most others, that it is monadelphous.

2. *G. Hematoxylon*. Swartz. Ind. Occ. 1199.—Blood-red Wood Tree.—Flower-stalks very short. Leaves elliptic-lanceolate, pointed, serrated, smooth. Petals inversely heart-shaped. Style deeply five-cleft.—Native of dry woody places on lofty mountains, in the west side of Jamaica; Dr. Swartz, from whom we have specimens. A tree, whose stem is from twelve to sixteen feet high, with a smooth greyish

bark, and round slender straight compound leafy branches, leaves two or three inches long, scattered, on footstalks, elliptic-lanceolate, tapering at both ends, with a bluntish recurved point, smooth on both sides, less coriaceous than in the former, their margin somewhat revolute, with numerous shallow serratures. *Flowers* from the bosoms of the upper leaves, solitary, on very short stalks, not so long as the footstalks, bearing one or two unequal bractæas; their petals pale flesh-coloured, unequal, deeply lobed, scarcely so large as those of *G. Lasianthus*, but flatter and more spreading. *Germen* silky, furrowed. *Style*, according to Dr. Swartz, divided into five. *Capsule* oblong, rather pointed. *Seeds* two in each cell, with an abrupt wing.—This tree was omitted by Dr. Swartz in his Prodromus, and is little known to botanists, having never yet been brought to Europe. It flowers in February and March. The wood is hard and of a blood-red, valued in Jamaica for making ornamental furniture, but as yet not known, or not distinguished, by European workmen. The peculiar structure of the style does not constitute any generic distinction here, any more than in the neighbouring genus *Stuartia*. See Sm. Exot. Bot. v. 2. 101.

3. *G. pubescens*. L'Herit. Stirp. Nov. 156. Cavan. Diff. t. 162. Vent. Jard. de la Malmaison, t. 1.—Flowers nearly sessile. Leaves downy beneath. Capsules globose.—Native of South Carolina, now not uncommon in green-houses, flowering in autumn. A handsome shrub, whose branches, calyx, and the backs of its leaves, are clothed with fine white depressed down. The flowers most resemble those of the first species, but one petal is considerably more concave than the rest, shorter, and downy, approaching to the nature of the calyx. The flower-stalks are extremely short and thick. Leaves obovate-lanceolate, acute, with shallow serratures, smooth and of a fine green above. Ventenat's figure, drawn by Redouté, the first in the splendid Jardin de la Malmaison, is one of the finest representations of a plant that can any where be seen, except that the French mode of printing in colours gives indiscriminately an idea of a downy surface, so that in this case both sides of the leaves look alike.

4. *G. Franklini*. L'Herit. Stirp. Nov. 156. (*Franklinia Alatamaha*; Marshall. Arbust. 49.)—“Flowers sessile. Leaves smooth. Capsules globose.”—Native of South Carolina. *Flowers* sessile, solitary, large, white, very much admired in their native country, but we have not heard of their being produced in Europe, nor have we seen even a dried specimen. The capsule, according to L'Heritier, is “globose and umbilicated. Seeds numerous in each cell, imbricated in two rows, slightly angular, much like those of the Cyperus, the angles somewhat bordered. Leaves alternate, on short foot-stalks, oblong, toothed, attenuated at the base, and smooth.”—Marshall and Bartram say the flowers smell like a china orange, and are often five inches in diameter, the lower petal hollow, enclosing the rest till they expand, as in *G. pubescens*. It was first observed by Mr. John Bartram in 1760, on the borders of the Alatamaha river, in Georgia.

GORDYGONG, in *Geography*, a town of Hindoostan, in Vishapour; 22 miles N.E. of Poonah.

GOE, in *Heraldry*, denotes one of the regular abatements, used, according to Guillim, to denote a coward. It consists of two arches or curve lines, drawn, one from the sinister chief, the other from the sinister base, and meeting in an acute angle in the middle of the fesse-point.

GOREE, or GORRE, in *Geography*, an island in the German ocean, near the mouth of the Meuse, about 10 miles in circuit; two miles N. of Schowen. N. lat. 51 490. E. long.

E. long.  $3^{\circ} 50'$ .—Also, a sea-port town of this island, near the E. coast, on a canal communicating with the Meuse; formerly carrying on a considerable trade, but the harbour is now choaked with sand; 6 miles W. of Helvoetsluys.

**GOREE**, a small island in the Atlantic, within cannon-shot of the coast of Africa, about two miles in circumference. The air is cool and temperate, being refreshed by alternate breezes from the land and sea. It is almost inaccessible on account of its surrounding rocks; but it has two bays, and a fort with several new buildings constructed by a late director M. de St. Jean, who has also rendered it a very strong place. By his persevering assiduity, springs of fresh water have been discovered, and a variety of vegetables and fruit trees have been planted; so that the island, once barren and despicable, is now made one of the most safe, pleasant, and important settlements in Africa. Goree was ceded to the Dutch in 1617 by a king of Cape Verd, and by them fortified. The Dutch were driven out by admiral Holmes in 1663, and the island was garrisoned by the English. It was two years after taken by De Ruyter, and its fortifications augmented by the Dutch; but in 1667 a French squadron compelled the Dutch to abandon Orange fort, and retire to fort Nassau; but here, incapable of defending themselves, they were obliged to surrender at discretion. Upon the arrival of M. du Casse, the island was formally taken possession of in the name of the Senegal company, and a treaty was concluded with the king and negroes of the neighbouring country on the same conditions with those by which the Dutch had possessed the island. The conquest was secured to the company by the treaty of Nimeguen. The French immediately repaired the forts, and changed their names, calling the lower fort "Verandois," and the higher "St. Michael." In 1750 Goree was taken by the English. By the treaty of 1763 Goree and its dependencies were left to the French. In 1778 it was taken by the English. N. lat.  $14^{\circ} 40'$ . W. long.  $17^{\circ} 30'$ .

**GOREE**, a small island on the coast of Brazil, at the mouth of the Rio dos Reyes Magos. S. lat.  $19^{\circ} 10'$ .

**GOREING**, or **GORING**, is said of a sail when cut slanting, so that it is broader at the clew than at the earing, as all top-sails and top-gallant-sails are.

**GOREL**, a name or title given to the prince of Georgia. The goral is always a Mahometan. The sphy of Persia obliges him to observe the religion of the Alcoran, in order to preserve the dignity of goral in his family.

**GORE'S BAY**, in *Geography*, a bay on the S. W. coast of the island of Tavai-Poanammoo. S. lat.  $43^{\circ} 12'$ . W. long.  $186^{\circ} 36'$ .

**GORE'S ISLAND**, an island in the N. Pacific ocean, so named by captain Cook in the year 1778. This is a narrow island, particularly at the low necks of lands which form a junction between the hills; it is about 30 miles long from N.W. to S.E.; and it appeared barren and uninhabited. Some sea-otters were seen. N. lat.  $60^{\circ} 40'$ . W. long.  $172^{\circ} 30'$ .

**GORESBRIDGE**, a small post town of the county of Kilkenny, Ireland, 51 miles S.W. from Dublin, on the road to Waterford.

**GOREY**, a post town of the county of Wexford, Ireland, also called Newborough, which, before the Union, was represented in parliament. It is  $45\frac{1}{2}$  miles S. from Dublin, and 21 N. from Wexford.

**GOREY-MOUNTAINS** of Ireland, in the county of Donegal, near Raphoe.

**GORGA**, a town of Mingrelia, on the Black sea; 30 miles S. of Anarghia.—Also, a river of Naples, which runs into the Liban, in Calabria Citra.

**GORCE**, in *Falconry*, is the uppermost bag or stomach

of a hawk or falcon, being that which receives the food the first.

The *gorge*, in *glucies*, is the same, in kind of *gorge*, with what we call the *craw* or *crop*. When the bird is dead, it is said to be *gorged*.

**GORGE**, in *Architecture*, denotes a fort of circular moulding, wider but not so deep as a scotia; used chiefly in frames, chambranles, &c.

**GORGE** of a *Chimney*, is that part between the chambranle and the crowning of the mantle. Of this there are divers forms; straight, perpendicular, in form of a bell, &c.

**GORGE** is sometimes also used for a moulding that is concave in the upper part, and convex at bottom; more properly called *gula* and *cymatium*.

**GORGE** is also used for the neck of a column; more properly called *colarum* and *gorgerin*.

**GORGE**, in *Fortification*, the entrance of a *Bastion*, or of a *Ravelin*, or other *Out-work*. See each article.

The **GORGE** of a *Bastion* is what remains of the sides of the polygon of a place, after retrenching the curtains; in which case it makes an angle in the centre of the bastion.

In flat bastions, the *gorge* is a right line on the curtain, reaching between the two flanks.

**GORGE** of a *Half moon*, or *Ravelin*, is the space between the two ends of their faces next the place.

**GORGE** of the other out-works is the interval betwixt their sides next the ditch.

All the gorges are to be made destitute of parapets; otherwise the besiegers, having taken possession of a work, might make use thereof to defend themselves from the fire of the place: so that they are only fortified with palisades, to prevent a surprize.

**GORGE**, *Half the Gorge*, *demi-gorge*, that part of the polygon between the flank and the centre of the bastion.

**GORGED**, in *Heraldry*, is when a crown, coronet, or the like thing, is borne about the neck of a lion, a swan, &c. In that case they say, the lion or cygnat is gorged with a ducal coronet, &c.

**GORGED** is also used when the gorge or neck of a peacock, swan, or the like bird, is of a different colour or metal from the rest.

**GORGED**, among *Farriers*, &c. signifies as much as swelled. In which sense they say, the legs of an horse are gorged; the pastern-joint is gorged; you must walk him out, to discharge his shoulder.

**GORGED**, in *Rural Economy*, a term which is sometimes applied to signify being *lown* by fresh luxuriant green food, and relates to cattle, &c.

**GORGERIN**, a part of the ancient armour, being that which covered the throat or neck of a person armed at all points.

**GORGONIAN**, or *Gorge*, in *Architecture*, the little freeze in the Doric capital, between the abacus, at the top of the shaft of the column, and the antracium.

Some call it *collarino*. Vitruvius gives it the name *lystracbelium*.

**GORGET**, in *Military Affairs*, a piece of brass or silver, worn by the officers of foot upon their breasts when on duty. The gorget hangs round the neck by a ribband; they are sometimes gilded, and have commonly some device engraved on them, as the sovereign's, or even the colonel's coat of arms, cross, or cypher.

**GORGET**, an instrument used in *Surgery*, for the purpose of cutting an opening into the bladder, so as to enable the operator to introduce the pair of forceps and extract the stone.

It is impossible to give the reader a proper notion of the form and manner of using the gorget, without presenting him with engravings of the instrument, and entering into a description of the operation of lithotomy. Hence, we must at present content ourselves with referring to the surgical plates, and the article LITHOTOMY.

Besides cutting gorgets, constructed for the above design, there are also blunt ones, intended to be introduced into the wound, when their concavity serves as a guide for the forceps into the bladder.

The employment of gorgets for the performance of lithotomy has been objected to by several eminent surgeons of the present day, particularly by Mr. John Bell of Edinburgh. (See his Principles of Surgery, vol. 2.) We have seen the operation most easily executed by means of a common scalpel. Mr. Astley Cooper uses, instead of a gorget, a common scalpel with a beak, which glides along the groove of the staff into the bladder. Several other knives and instruments have been at different times invented to supersede the gorget. The principal ones will be represented in the surgical plates, and due notice will be taken of them in the article LITHOTOMY.

GORGAS, surnamed *Leontinus*, in *Biography*, born at Leontium in Sicily, from whence he derived his second name, was a celebrated orator and learned sophist, who flourished in the fifth century before the Christian era. He was a disciple of Empedocles, and is reckoned one of the earliest writers on the art of rhetoric. He is thought to have introduced numbers into prose, treated of common places, and shewed the use of them for the invention of arguments. Hence Plato gave the name of Gorgias to his elegant dialogue on this subject, which is still extant. He was so great an orator, that in public assemblies he would undertake to declaim extempore upon any subject proposed to him. In the war between Syracuse and Leontium, the citizens of the latter applied to the Athenians for succour, and employed Gorgias and Tisias as their ambassadors, the former of whom was peculiarly qualified to influence popular assemblies by his bold and persuasive eloquence. On their arrival at Athens about the year 427 B. C., Gorgias made an oration to the people on the grievances which their countrymen suffered from the people of Syracuse, and the advantages which would accrue to them from sending a powerful army into Sicily, by which he persuaded them to rush headlong into a war, that proved in the end more fatal to them than any in which they had engaged. Afterwards he made a display of his eloquence at the Olympic and Pythian games, on account of which a golden statue was erected to his honour at Delphi. He is said to have lived to the great age of 107 or 108.

GORGOLIONE, in *Geography*, a town of Naples, in the Basilicata; 15 miles E. of Venosa.

GORGONA, an island of small extent and of a circular form, in the Mediterranean, about 16 miles from the coast of Etruria. The mountains, says Sonnini, seem to be of the same nature with those of the continent. This island is famous for the anchovy fishery on its coasts. N. lat. 43° 22'. E. long 9 56'.—Also, an island in the Pacific ocean, about 18 miles from the coast of Peru, about 10 miles in circumference. N. lat. 3° 36'. W. long. 77 52'.

GORGONEUM, Γοργώνεον, in *Antiquity*, a kind of masque used on the ancient theatre to represent hideous and frightful figures, in imitation of the Gorgons. Mem. Acad. Inscript. tome v. p. 184.

GORGONIA, in *Zoology*, a genus of Zoophytes, the stem of which is coriaceous, woody, corky, horny, or somewhat bony, and in general flexible; the texture glassy,

fibrous, or like stone, striated, tapering, fixed at the base, which is dilated, and covered with vascular or cellular flesh, or bark of a spongy and friable nature in a dried state, the mouths or cells covering the surface of the stem and bearing polypes.

These marine productions were regarded by the ancients as a class of plants, and described as such by their botanists; nor was this idea, however remote from truth, exploded till so late a period as the eighteenth century, when the discoveries of Peyssonel upon the nature of coral, published in 1727, and those of Trembley on the hydra (or polype) about fourteen years after, contributed to demonstrate, in a very explicit manner, that the gorgonia in common with other zoophytes (as these particular bodies are now denominated), do not appertain to the vegetable, but animal kingdom, or are at least the fabrication and genuine habitations of animals.

Among the various observers of this curious order of animal productions, few, if any, have pursued their investigations with greater discrimination and success than professor Pallas, or our own countryman Ellis, and his friend Dr. Solander; nor indeed can we hesitate to confess that our knowledge of the gorgonia tribe has been enlarged only in a very inconsiderable degree by any of the subsequent authors on this subject. The latest observations tend principally to confirm the accuracy of those writers who had before assured us the gorgoniae are the habitations of various kinds of polyiferous animals, each of which resides in a distinct cell; that they lie in general dormant or contracted during winter, and, like the blossoms of plants, push forth buds, and expand in their proper season, which is constantly in summer. The stem and branches of the gorgoniae, which are most commonly of a somewhat horny and flexible nature, may be considered as the true skeleton of these nests of habitations, being covered with a fleshy or pulpy substance, the exterior surface of which is porous. These pores are the mouths or openings of the cells in which the polypes are lodged, and it is the number, disposition, and varied structure of these, in addition to the general aspect of the plant-like nest of habitations, that constitute the most material differences by which the various species are distinguished; the figure of the animal, when it can be ascertained, forming the secondary or least important character. It may be lastly observed, that the gorgoniae differ exceedingly in size, being from one to two, or perhaps three feet in height, while other species in deep bays, and similar situations of the sea, no less favourable to their growth and increase, attain to the gigantic height of ten or twelve feet, and from their number as well as magnitude; their remarkable ramose, and foliated or flabelliform appearance; interwoven structure, and coral-like texture, form a conspicuous portion of those vast submarine "groves of coral" that are sometimes seen by navigators in the hotter regions of the globe.

#### Species.

LEPADIFERA. Dichotomous, with crowded, imbricated, reflected, campanulated florets. Müll. *Gorgonia refeda*, Pallas. *Gorgonia refediformis*, Gunner. *Refeda marina*, Bell.

Native of the Norway seas, from eighteen inches to two feet high; flesh pale, with whitish skin or scales; stem white, with a stony base and cartilaginous branches.

VERTICILLARIS. Pinnate, ramose, with alternate parallel subdivisions, covered with verticillated incurved florets. Müll. Pallas, &c. *Sea-feather*, Ellis.

From two to three feet high; stem brittle and white, with flexible branches. Native of the Mediterranean and North seas.

# GORGONIA.

**PLACOMUS.** Branching both ways, with flexuous, and rarely uniting or anastomosing branches, covered with conic florets. Linn *Warted-sea-fan*, Ellis. *Lithoxylon*, &c. Breyh.

Height two feet; stem erect, woody, and yellow, scarlet or reddish cinereous. Inhabits the Indian and European seas.

**MOLLIS.** Coriaceous, dichotomous, with perpendicular tubular florets. Pallas.

Native of the Mediterranean, and about eighteen inches in height, the colour brown violet; stem brown; branches long and slender.

**SUCCINEA.** Round, amber-colour, dichotomous, rigid, the stem covered with tubercular gaping florets. Pallas.

A very rare species, the native place of which is unknown; it is only six inches high, the stem testaceous.

**AMERICANA.** Branched and sub-divided, the sub-divisions nearly opposite, compressed, with rows of polypiferous cells on each margin; flesh yellowish, within pale purple; bone horny. Gmel. *Gorgonia pinnata*, Soland. and Ellis.

Native of the West Indies; flesh purplish or yellowish.

**EXSERTA.** Round, with a few alternate branches; florets alternate, eight-valved; flesh covered with minute white scales; bone brownish, horny. Soland.

Height two feet; branches long, slender, and white; polypes with eight feelers and exerted. Inhabits the West Indies.

**PATULA.** Compressed, with flexuous sub-pinnate branches, crimson, with two rows of florets each side, each surrounded with a whitish ring; bone brownish, horny. Soland.

Native of the Mediterranean.

**CERATOPHYTA.** Branched, with divaricate erect sub-divisions, each marked with two furrows; florets white, in irregular rows; flesh purple; bone black and horny. *Gorgonia ceratophyta*, Soland. *Corallina fruticosa purpurea*, C. Bauh. *Lithophyton*, &c. Geln. *Corallina fruticosa erectior*, Catesby.

Found in the Mediterranean, Atlantic, and South American seas; height twelve inches; flesh bright purple.

**JUNCEA.** Stem simple, round, and tapering both ways; bone dusky, horny; flesh orange-colour, with two furrows; florets longish. Soland. &c. *Junci lapidei*, Plin. *Palmjuncus albus*, Rumpf.

Inhabits the shores of the American islands adhering to stones; height about three feet, and very flexible when alive.

**FLAMMEA.** Compressed, branched, and sub-pinnated; bone flat and horny; flesh bright red, with minute florets. Soland. and Ellis.

A beautiful species, of a fiery red or flame-colour when recent; this kind inhabits the African coast, and appears to be found in most abundance near the Cape of Good Hope.

**UMBRACULUM.** Fan-shaped, and somewhat reticulated; branches numerous, divergent and round; flesh reddish, warted or covered with florets. Soland. and Ellis.

Native of the Indian sea; stem short, rising from a broad base, divided into about two or three branches, the smaller ones rising from which are numerous, and so intimately connected as to form a kind of net-work.

**PURPUREA.** Somewhat dichotomous, with divaricate slender branches; flesh violet and sub-verrucofe. Pallas.

Round, smooth and blackish, with the extremities of the branches yellow. A South American species.

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**SASAPPO.** Sub-dichotomous, round, with divaricate slender branches; flesh red, with numerous hairy florets. Pallas. *Accarbaar sasappo f. virga sanguinea*, Rumpf.

About twelve inches in length, the texture horny, and colour black. The bernacl is frequently observed adhering to this species.

**PALMA.** Flat, with numerous very long and simple divisions; flesh smooth, sprinkled with simple pores. Pallas. *Chamaripha peregrina*, Clusius.

Grows to the height of six feet, though more commonly not exceeding two or three feet; the substance horny, covered with a calcareous coating, and flexible. Inhabits the Indian ocean.

**RADICATA.** Very much branched, and corky; with minute scattered pores, and many-cleft at the base. Pallas, Seba, &c.

Native of the African seas; sub-dichotomous, grey, with branched trunk, and in substance resembling cork.

**SUBEROSA.** Woody, very much branched, diffuse, the branches compressed and grooved, and covered with stellated scattered pores. Pallas.

Height three feet; flesh red, spongy; bone pale red and corky; branches long, round and erect. Found in the Indian and African seas.

**CORALLOIDES.** Woody, erect, sub-dichotomous, and variously formed; flesh tuberos, with stellated tuberculated florets. Pallas. *Corallina lignum incrustans*, Boec.

Native of the Mediterranean; length one foot, very tough, pale grey, with yellow florets.

**ELONGATA.** Dichotomous, divaricate, with the flesh red, and covered with papillous scattered sub-imbricated pores. Gmel. &c.

Pale and brittle, with square branches with pores at the angles; grows to the height of four feet, and inhabits the Atlantic.

**SCIRPEA.** Very simple, straight, with a decomposite leafy base, and soft tuberculated flesh. Pallas.

Fuscous, tapering towards the tip; the flesh cinereous when dry; inhabits the Indian seas.

**SETACEA.** Simple, rigid, with calcareous white sub-tuberculated flesh. Pallas. *Isidis plocanum*, Mercat.

Native of the American ocean.

**VIMINALIS.** Very long, depressed, branched, with erect sub-divisions; flesh yellow; florets seated along each margin of the branches, and rather prominent. Pallas. *Isidis plocanum* II. &c. Mercat.

Height eight inches; branches long and slender; bone blackish and horny; florets white; the polypes furnished with eight feelers or claws. Native of the Atlantic and Mediterranean.

**MURICATA.** Round, with depressed sub-divided branches; flesh thick; pores cylindrical and sponous. Pallas, Ellis, &c. *Epicorallum*, &c. Petiv. *Lithophyton*, Tournef.

Native of the American islands; height from two to three feet; coriaceous, horny, with a whitish medullary nerve.

**VERRUCOSA.** Bifarious, with round, sub-dichotomous flexuous branches; flesh calcareous, pores whitish and prominent. Pallas, Ellis, &c. *Lithophyton muricatum*, Geln. *Corallina alba nodosa*, C. Bauh. *Frustra nanum flabelliformis*, &c. Ray. *Erica marina*, &c. Petiv.

Inhabits the West Indian, Mediterranean, and rarely the British seas, adhering by the broad base of the principal trunk to the rocks, and rising to the height of twelve or

## G O R G O N I A.

fifteen inches, and sometimes rather more, in a fan-like form; colour when dry greyish-white; bone of a texture between horn and wood.

**ANTIPATHIS.** Shrubby, with erect, alternate panicled branches; bone with flexuous striæ; flesh thick and smooth; pores large and scattered. Pallas, &c. *Antipathes*, &c. Lobel. *Coralium nigrum Dieffenridis*, ib. *Lithophyton nigrum arboreum*, Tournef. *Acabalar pohn*, Valent.

Grows to the height of two feet, and inhabits the Indian and Mediterranean seas. This is the black coral of the shops.

**NOBILIS.** Dichotomous, the branches somewhat tapering; flesh red, spongy, and soft; the surface speckled with numerous eight-valved, conic, and rather elevated, irregularly disposed pores; bone bright red, striated, and slightly punctured externally. Soland. and Ellis, &c. *Ips nobilis*, Linn. Syst. Nat. XI. *Madreppearabra*, Linn. Syst. Nat. X. *Ips Pallas*. *Coralium nobilis*, Donat. *Red coral*, Ellis.

The bone of this species constitutes that beautiful and much esteemed marine production, the red, or true coral of the jewellers. The coral is a general inhabitant of the Mediterranean, Adriatic, and Red seas, and appears to be no where more abundant than in the sea about Marseilles, Corsica, Sicily, and the coast of Africa, in the vicinity of Barbary, the coral fisheries in those parts being carried on with great spirit, and proving highly lucrative. From the observations of Donat, an author who has devoted much attention to this curious subject of enquiry, we understand that the flesh or exterior coating of the coral is of a red colour, varying from bright to paler hues, the tint of which is uniformly less brilliant than that of the bone or coral itself. The most prevalent colour of the bone is red, exhibiting all the transitions from a pale rose colour to fine scarlet, and sometimes inclining to yellowish or fine saffron. The coral grows in a shrubby form, and not infrequently in an inverted form, to the height of a foot or eighteen inches, which latter it rarely exceeds, nor is the circumference of the largest branches more than one inch. Externally the surface is striated, more or less nodulous or warted, and the substance when broken appearing composed of a number of concentric layers. The coral of this species is equal in hardness and durability to the most compact marble, and these material qualities, in addition to its beautiful texture or grain, and colour, have contributed to render it valuable in the estimation of the world from the earliest ages, as we learn from Pliny, and other writers of remote antiquity. At this day the true coral bears a considerable price throughout the East as well as in Europe; its supposed medicinal virtues have, however, fewer votaries at present than formerly. The polypes, by which the cells are occupied, are furnished each with eight arms or tentacula, in the centre of which the mouth is situated; these arms are retractile, contract immediately on being touched; the cells or pores are filled with a white liquor, and the polypes are likewise white.

**AVICULA.** Panicled, sub-dichotomous; stem and branches compressed; flesh calcareous; margin porous. Gmel. Pallas, &c. *Sea willow*, Ellis. *Epicoradum virgatis alatis*, Patis.

Inhabits the American, and some of the European seas; height nearly two feet; bone roundish, tapering to the ends, and white when recent.

**CHYSEA.** Round, dichotomous, with long, thick, divaricated, erect branches; flesh thick, violet, with small prominent, approximate, equidistant pores; bone dark brown and horny. Soland. and Ellis.

Native of the American seas.

**PINNATA.** Rather compressed and pinnated, with very

simple compressed branches; flesh red with oblong pores. Linn. *Palma pelagica*, Theophr. *Lithoxylon*, Breyn.

Grows to the height of from one to four feet; the texture horny and brown, the branches yellowish. Native of the African and North seas.

**SANGUIOLENTA.** Depressed, very ramose, and pinnated; flesh yellow, with purple pores in double rows. Pallas. *Lithophyton flavum punctatum*, Tournef.

Native of the Atlantic and Mediterranean seas; height one foot.

**VIOLACEA.** Rather depressed, with pinnated branches; flesh violet: nearly square, with somewhat prominent pores. Pallas. *Quercus maris*, Theophr.

Inhabits the American seas, above a foot long, and horny.

**SETOSA.** Round and pinnated, with diffuse branches; flesh purplish. *Antipathes hirsutum*, Pon. *Lithophyton*, Tournef.

Grows to the height of two feet; very upright, and inhabits the Mediterranean and American seas.

**PETECHIZANS.** Sub-dichotomous, very much branched, with a yellow bifurcated flesh covered with red pores. Pallas. Gmel. &c.

Native place unknown: bone horny, black, with amber-coloured ramifications.

**PACTINATA.** Round, with parallel ascending simple branches; flesh red, with gibbous scattered pores; bone white, hard, and brittle. Gmel.

Very rare, white, with red flesh; found in the Indian ocean.

**ABIENTINA.** Ramose pinnated; flesh yellow, with rows of purple florets each side; bone horny and yellowish. Soland. and Ellis.

Native of the African shores, and seldom exceeds a foot in height.

**CALYCVLATA.** Dichotomous and subdivided, with erect thick ramifications covered with truncated papillæ; flesh cinereous, within purplish; cells large and cup-shaped; bone dark brown and horny. Ellis.

Inhabits the American seas.

**BRIAREUS.** Subramose, round, thick; flesh pale or whitish within, externally cinereous; bone composed of small purple glassy needles, irregularly and closely disposed longitudinally. Soland. and Ellis.

Cells large, prominent, numerous, and irregularly disposed; the species inhabits the West Indies.

**VENTALINA.** Reticulated; branches compressed externally at the sides; bark red. Gmel. *Lithoxylon retiforme*, &c. Clifford Hort. *Gorgonia ventilabrum*, Pallas. *Flabellum marina*, Rumpf.

Black or brown; the species inhabits the Indian ocean.

**RETICULATUM.** Reticulated, branches with very close set round ramifications, and red tuberculated bark.

Very ponderous, of a grey colour, and inhabits the Indian ocean.

**CLATHRUS.** Reticulated, woody; with round ramifications; flesh smooth with simple pores. Pallas.

Native place unknown; about eight or ten inches in height, pale, with a thin reddish-grey flesh.

**FLABELLUM.** Reticulated; branches compressed internally; flesh yellow. Gmel. *Gorgonia*, Pallas. *Flabellum ceneris*, Ellis. *Frutex marinus*, Cluſius. *Froncipora*, Bonann. *Keratophyton reticulatum*, Brown. *Arbre de mer*, Rochef.

The bone is black, horny, and slightly striated on the larger branches.

Found adhering to various substances, and varying in colour



colour from yellow to purple: this species inhabits moist seas.

**GORGONIUM**, in *Botany*, a name given by some authors to the common eryngium or eryngo, the roots of which we use candied.

**GORGONS**, in *Antiquity and Mythology*. Authors are not agreed in the account they give of the Gorgons. The poets represent them as three sisters, whose names were Stheno, Euryale, and Medusa, the daughters of Phorcus by Ceto; the latter of whom was mortal; and having been deflowered by Neptune, was killed by Perseus; the two former were subject neither to age nor death. They are described with wings on their shoulders, with serpents round their heads, their hands were of brass, and their teeth of a prodigious size; so that they were objects of terror to mankind. Æschylus, in his *Prometheus*, adds, that they had but one eye and one tooth among all the three, which they made use of one after the other, and that they killed men with a single glance of the eye.

Pindar (*Pyth.* 12.) improves upon Æschylus, and heightens the fable by these circumstances, unknown to his predecessors. The first is, that the Gorgons turned those into stone whom they looked upon, and that it was by this kind of death that Perseus, in presenting Medusa's head, desolated the island of Seriphus, whose inhabitants he petrified, together with their king. The second is, that Minerva, who aided Perseus while he was struggling with Medusa, being surprised with the melody of the Gorgons' sighs, intermingled with the hissing of their serpents, felt certain charms in that mixed composition of doleful accents; and to renew the idea of the harmony, she invented a flute in imitation of it, which she imparted to men; and in allusion to its first model she called the various sounds it produced "a Harmony with many heads." The third is, that Pegasus, whom Hesiod represents as having taken flight to the mansion of the gods, was afterwards broke by Minerva, and given to Bellerophon, who mounted him to combat the Chimæra; but that hero having attempted to ascend to heaven on the wings of that horse, was thrown down to the earth, and Pegasus placed among the stars. (Pindar's *Oli.* iii. *Pyth.* vii.) The Latin poets, though faithful copiers of the Greek ones, have yet loaded the fable of the Gorgons with new circumstances. Homer had said, that the Gorgon's head was engraved upon the tremendous Ægis of Minerva; Virgil adds, and upon her cuirass too, in the place which covered the goddess's breast:

"—— Ipsamque in pectore Divæ  
Gorgona deflecto vertentem lumina collo." *Æn.* l. viii.

After the death of Medusa, her sisters, according to Virgil, were appointed to keep the gate of the palace of Pluto:

"Multaque præterea variarum monstra ferarum—  
Gorgones, Harpeiaque——" *Æn.* l. vi.

Osid of all the poets has more enlarged upon the fable of the Gorgons, and added several particulars which are only found in his *Metamorphoses*, l. iv. and v.

Diodorus Siculus will have the Gorgons and Amazons to have been two warlike nations of women, who inhabited that part of Lybia which lay on the lake Tritonidis. The extermination of these female nations was not effected till Hercules undertook and performed it.

Pausanias says, the Gorgons were the daughters of Phorcus, probably by mistake for Phorcus; after whose death, Medusa his daughter reigned over the people dwelling near the lake Tritonidis. The queen was passionately fond of hunting and war, so that she laid the neighbouring countries

quite waste. At last, Perseus having made war on them, and killed the queen herself, when he came to take a view of the field of battle, found the queen's corpse so extremely beautiful, that he ordered her head to be cut off, which he carried with him to show his countrymen, the Greeks, who could not behold it without being struck with astonishment.

Others represent them as a kind of monstrous women, covered with hair, which hid in wool and floss. Other, again, make them animals, resembling wild sheep, whose eyes had a poisonous and fatal influence.

Xenophon of Lampfacus, who is followed by Piny and Solinus, was of opinion, that the Gorgons were female savages, who inhabited the islands Gorgades. Hanno, the Carthaginian general, penetrated as far as these islands, where he found women, who, in fierceness, outran the flight of birds. Gerard Vossius, in his "Origin and Progress of Idleness," is persuaded, that the fable of the Gorgons took its rise from the relation of Hanno the Carthaginian general, above cited, from Xenophon of Lampfacus. The Chinese, on the contrary, in his notes upon Hesiod, takes them for the mares of Lybia, which the Phœnicians in a voyage to Africa had taken away. Banier (*Mythol.* vol. iii.) is of opinion that the Gorgons dwelt in that part of Lybia, which was afterwards called Cyrenaicam; and that Phorcus, their father, had conquered Ithaca, which was not far from the coast of Africa, where he resided. It is not incredible that this prince would employ his fleet in carrying on an advantageous trade, and that Polydectes, king of Seriphus, in order to get rid of Perseus, gave him some ships for the purpose of pirating on the coasts of Africa. Perseus accordingly, thus equipped, sailed from the isle of Seriphus for the coast of Lybia, and having fallen in with the fleet of Phorcus, made himself master of some of his ships and a part of his riches. These ships, it is said, bore the names of Medusa, Stheno, and Euryale. They were loaded with the teeth of elephants, the horns of fishes, and the eyes of hyenas, which Phorcus bartered for other goods. This, it is said, is the mystery of the tooth, horn, and eye, which the Gorgons borrowed by turns; that is, the ships, when arrived in the port, took each of them goods proper for the place to which they were bound. The other fictions that accompany this history, says the author now cited, will explain themselves.

For a farther account of them, see *Mem. Acad. Inscript.* vol. iv. p. 72, seq. See *MEDUSÆ caput*.

**GORGONZUOLO**, in *Geography*, a town of Italy, in the department of the Olona; 10 miles N.E. of Milan.

**GORORA**, an island of Abyssinia, in the lake Dembea (which see), where a palace was built, which is the usual residence of the emperor in winter.

**GORHAM**, a post town of America, in Cumberland county and state of Maine, on the N.E. side of Saco river, 130 miles N.E. from Boston; incorporated in 1762, and containing 2053 inhabitants.

**GORTO**, ANTHONY FRANCIS, in *Biography*, a learned antiquary of the eighteenth century, a native of Florence, was author of the following works, *viz.* "Museum Florentinum," or a description of the cabinet of the Grand Duke, eleven volumes folio, with a great number of plates; "Museum Etruscum," three volumes, folio. "Museum Cortonenfe," folio. "Ancient Inscriptions in the Towns of Tuscany," three volumes folio.

**GORITZ**, or **GORZ**, in *Geography*, a country of Germany, in the circle of Austria; bounded to the N.E. and S. by the duchy of Carniola, and on the W. by the Venetian states. The chief produce of the country consists in wine and fruit, with some corn and silk; the horses and oxen are

few, but the goats are numerous. The language of the country is Slavonian, and the religion Roman Catholic.

**GORITZ**, or *Goritia*, a town of Germany, situated in the above-mentioned country, and divided into Upper and Lower town; the former is ancient, seated on a mountain, and defended by a castle; the latter is situated on a plain on the river Lifonzo. Besides the church, since the year 1784, not metropolitan, it has seven convents, nine chapels, and a college. In 1797 it was taken by the French; 20 miles N.N.W. of Trieste. N. lat. 46° 5'. E. long. 13° 33'.

**GORITZ**, a town of Brandenburg, in the New Mark, seated on the Oder, formerly the metropolis of the circle of Lebus.

**GORKA**, a town of Hindoostan, in Mewat; 12 miles S.S.W. of Cottilah.

**GORKAH**, a town of Asia, situated in the N.E. part of the small state so called, on the borders of Napaul; 35 miles N.W. of Catmandu. N. lat. 28° 25'. E. long. 84° 36'. The country lies between the province of Oude and Thibet, and is governed by a raja dependent of Thibet.—Also, a town of the duchy of Warlaw; 40 miles S. of Posen.

**GORLÆUS**, **ABRAHAM**, in *Biography*, a celebrated medallist, was born at Antwerp in 1549. He devoted himself entirely to the collection of ancient medals, seals, rings, and other curiosities. He died at Delft, where he spent the greatest part of his life, in the year 1609. His works are entitled "Dactylitheca seu Annulorum Sigillorumque e Ferro, Ære, Argentis, atque Auro Promptuarium;" "The-saurus Numismatum familiarum Rom.;" "Paralipomena Numismatum." His works are highly valued by those who are addicted to these studies. Moreri.

**GORLITZ**, in *Geography*, a town of Upper Lusatia, seated on the river Neisse, and the first town in the county with regard to size, population, and wealth. Within the walls it has three churches, and as many without. The principal trade is brewing, with woollen and linen manufactures. 50 miles E. of Dresden. N. lat. 51° 9'. E. long. 15° 37'.

**GOROCHOVETZ**, a town of Russia, in the government of Vladimir; 72 miles E. of Vladimir. N. lat. 56° 10'. E. long. 42° 34'.

**GORODITSCHIE**, a town of Russia, in the government of Penza; 32 miles E.S.E. of Penza. N. lat. 53° 20'. E. long. 46° 34'.—Also, a town in the government of Kiev, 112 miles S.E. of Kiev. N. lat. 49°. E. long. 32° 54'.—Also, a town in the government of Tobolsk, 20 miles E.S.E. of Enisk.

**GORODNIA**, a town of Russia, in the government of Tver, on the Volga, 23 miles E. of Tver.

**GORODNITZSK**, a town of Russia, in the government of Tchernigof, on the Snov; 32 miles N.N.E. of Tchernigof.

**GORODOK**, a town of Russia, in the government of Poletsk; 35 miles E. of Poletsk. N. lat. 55° 36'. E. long. 29° 54'.

**GORON**, a town of France, in the department of Mayenne, and chief place of a canton, in the district of Mayenne; 9 miles N.W. of Mayenne. The place contains 1800, and the canton 12,733 inhabitants, on a territory of 200 kilometres, in 11 communes.

**GORONGO**, a small island in the East Indian sea; 20 miles S. of Gilolo. S. lat. 1° 8'. E. long. 128° 33'.

**GORONFALE**, or **GORONTANO**, a town on the E. coast of the island of Celebes:

**GORPETA**, a town of Hindoostan, in Berar; 24 miles W. of Chandur.

**GORRIS**, **JOHN DE**, in *Biography*, was born at Paris in

the year 1505. He took the degree of doctor of physic in that city about 1540, and was appointed dean of the faculty in 1548. He is said to have possessed both the learning and sagacity requisite to form an accomplished physician, and to have practised with great humanity and success. His works contributed to support this reputation. The greater part of them consists of commentaries on different portions of the writings of Hippocrates, Galen, and Nicander. During the civil war, which was fatal to numerous men of letters, John de Gorris was stopped by a party of soldiers, when on his journey to Melan to visit the bishop of Paris, and the fright which he sustained is said to have deprived him of his reason. This occurred in 1561, and he lived many years in this deplorable condition, having died at Paris in 1577, at the age of 72.

His father, also John de Gorris, was a physician at Bourges, attained considerable eminence, and left two works, one on the general "practice of medicine," dated 1555; the other, a "collection of formulæ," 1560, both in Latin. Eloy Dict. Hist.

**GORRITI**, in *Geography*, a small island in the river La Plata.

**GORSA**, a small island near the S. coast of Cuba. N. lat. 21° 45'. W. long. 81° 25'.

**GORSE**. See **FURZE** and **ULEX**.

**GORSIO**, in *Geography*, a town of Sweden, in Helsingland; 30 miles W. of Hudwickfwall.

**GORT**, a post town of Ireland, in the county of Galway. It stands on an eminence, and is a dirty straggling town, but can boast of a few good houses. Adjoining to it are the ruins of a castle, and near it is Kilmacduagh, the see of a bishop. Gort is 98 miles W. from Dublin.

**GORTER**, **JOHN DE**, in *Biography*, a physician, who, after having been a disciple of the celebrated Boerhaave, became a distinguished teacher of medicine at Harderwick, his native place; in consequence of which he was elected a member of the academies of Petersburg, Rome, and Haerlem, and obtained the title of physician to Elizabeth, empress of all the Russias. He was the author of several works, which are written with excellent method, and contain many interesting and original observations. He died on the 11th of September, 1762, at the age of 74.—His works, the titles of which are enumerated by Eloy, relate to physiological and practical subjects, as well as to the practice of the ancients. Eloy. Dict. Hist.

**GORTERIA**, in *Botany*, named by Linnæus after David De Gorter, professor of physic and botany in the Dutch university of Harderwick, author of several local Floras of that neighbourhood, and of *Elementa Botanica*. He died in 1783, aged 66. (Dryandr. Bibl. Banks. v. 5. 256.) Linn. Gen. 441. Schreb. 576. Willd. Sp. Pl. v. 3. 2265. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 3. 254. Juss. 182. Gærtn. t. 171. Lamarck. Illustr. t. 702. (Gazania: Lamarck. Illustr. t. 702. Personaria; ibid. t. 716.) Class and order, *Syngenesia Polygamia-frustranea*. Nat. Ord. *Compositæ*, Linn. *Corymbifera*, Juss.

Gen. Ch. *Common calyx* of one leaf, imbricated with spinous scales, the innermost gradually longer, straight, bristle-shaped, rigid. *Cor.* compound, radiated. Florets of the disk numerous, perfect, with a funnel-shaped five-cleft corolla: those of the radius fewer, female, with a ligulate lanceolate one. *stam.* (in the perfect florets only) Filaments five, short; anthers united into a cylindrical tube. *Pist.* (of the perfect florets) Germen hairy; style thread-shaped, the length of its own little corolla; stigma cloven. In the female florets the germen is obsolete and abortive; style none; stigma none. *Peric.* none, except the calyx, falling-off

eff. entire. Seeds to the perfect florets only, solitary, roundish. Down simple or woolly. Receptacle naked.

Eff. Ch. Receptacle naked. Down simple or woolly. Florets of the radius ligulate. Calyx of one leaf, clothed with imbricated scales.

All the plants ranged under this genus are natives of the Cape of Good Hope. In the 2d edition of Linnæus's *Species Plantarum*, where it first appears, are five; *personata*, Jacq., Coll. v. 4. t. 21. f. 1; *rigens*, Curt. Mag. t. 90; *squarrosa*, *ciliaris*, and *fruticosa*. The latter is the same plant as *G. asferoides*, Linn. Suppl. 381, but different from *Atractylis oppositifolia*, under which it is quoted in Syst. Veg. ed. 14. 730. To the above are added, in the Mantissa, p. 287, *G. festiva*; and in the Supplementum six more, *herbacea*, *bispida*, *spinosa*, *cernua*, *uniflora*, and *barbata*. Of these the *uniflora* is there suspected, we believe justly, to be a mere variety of *rigens*.

The genus thus understood undoubtedly forms a very unnatural assemblage, Linnæus having chiefly considered the simple-leaved calyx, as Gærtner long ago remarked. Willdenow accordingly has but seven *Gorteria*, the *personata*, *rigens*, and *cernua* of Linnæus, with *diffusa*, *int. griffolia*, *peñinata*, and *clivata* of Thunberg. Others are sent to his genera of *Mufsonia*, whose receptacle is villous, and feed-down formed of simple hairs; and *Berckheya*, whose receptacle and feed-down are chaffy. Among the latter are the beautiful and truly wonderful *G. ciliaris*, and the *spinosa*; the latter figured in Jacq. Hort. Schönbr. t. 372. This is doubtless a great improvement, but it seems to us that the genus must, after all, chiefly depend on *G. personata*, which is an annual plant, of no beauty, with many spreading stems, about a foot high. Leaves alternate, spatulate, revolute, pinnatifid or undivided; very white and cottony beneath; and green and bristly, like the stems, above. Flowers solitary, terminal, small, yellow, with numerous prominent spines to the calyx. The seeds are crowned with wool, but have no proper pappus or feed-down. The leaves of *G. rigens* bear some analogy with this, but the large orange blossoms, unarmed calyx, and long simple feed-down, urge the propriety of separating it. The latter is Lamarck's *Gazania*, above quoted.

GORTYNA, or GORTYN, in *Ancient Geography*, an inland city of Crete, being, according to Strabo, near 90 furlongs distant from the African sea, or that part of the Mediterranean which washed the southern part of the island. Its origin is obscure, some ascribing it to Gortyn, the son of Rhadamanthus, and others to Taurus, who carried off Europa. In process of time, however, it eclipsed all the other cities of Crete, especially after the island was reduced by the Romans. Of its ancient splendour and magnificence we may form some judgment from its ruins, which are still visible about six miles from mount Ida; though many of them have been carried away by the Turks. In ancient times it was famous for the temples of Apollo, Diana, and Jupiter Hecatombræus, so called because Menelaus there sacrificed to Jupiter 100 oxen, when he received information of Helena's flight. Its walls were washed by the river Lethe. Theophrastus, Varro, and Pliny speak of a plane tree near Gortyna, which never shed its old leaves till new ones sprouted forth.

GORTYNIA, a town of Greece, in the northern part of Macedonia.

GORUAH, in *Geography*, a town of Hindoostan, in Bahar; 62 miles W.S.W. of Bahar.

GORY, a town of Georgia, in the province of Carduel, on the Kur; 45 miles W. of Teflis. N. lat. 41° 55'. E. long. 44° 30'.

GORZE, a town of France, in the department of the Moselle, and chief place of a canton, in the district of Metz;

7 miles S.W. of Metz. N. lat. 49° 3'. E. long. 6° 4'. The place contains 1535, and the canton 14,278 inhabitants, on a territory of 220 kilometres, in 31 communes.

GORZEGNO, a town of France, in the department of the Stura, on the Bormida; 13 miles S.E. of Aiba. N. lat. 44° 58'. E. long. 8° 17'.

GORZKE, a town of the principality of Magdeburg; 54 miles E. of Magdeburg.

GOSAYPOUR, a town of Hindoostan, in Allahabad; 13 miles N.W. of Jionpour.

GOSCHGOSCHUENK, a town of America, in the Delaware, consisting of three villages situated on the banks of the Ohio. Its name signifies "the habitation of owls," from the number of those birds that resort thither.

GOSCHUTZ, a town of Silesia, in the principality of Oels; 25 miles N.N.E. of Breslaw. N. lat. 51° 23'. E. long. 17° 30'.

GOSSELINI, JULIAN, in *Biography*, an Italian writer, was born at Rome in 1525, where he pursued his mature studies in the house of the cardinal de Santa Fiora. When he was seventeen years of age he was taken into the service of Ferdinand Gonzaga, then viceroy of Sicily. He accompanied that nobleman to Milan in 1546, and became his secretary, and was afterwards taken to the court of Spain, where he obtained the esteem and favour of Philip II. Under the duke of Albuquerque he was imprisoned on a charge of conspiracy against the life of Giambatista Monti. He vindicated his own cause, was released, and admitted to public employment. He died in 1587, leaving behind him several works, that obtained for him high reputation: of these the principal are, "The Life of Ferdinand Gonzaga," "Three Conspiracies, &c." "Rime," or a collection of poems, several times reprinted. "Discourses." "Letters," &c. Bayle.

GOSFIELD, in *Geography*, a township of Essex county, in Upper Canada, situated upon lake Erie.

GOSHAWK, in *Ornithology*, the English name of the *FALCO palumbarius*; which see.

GOSHEN, in *Ancient Geography*, a territory of Egypt, situated between the Red sea and the Nile, upon the borders of Canaan, not far from On or Hieropolis, which Joseph obtained of Pharaoh for the residence of his father Jacob and family. This was a fertile spot of ground, and fit for cattle: and, therefore, as Josephus tells us, Pharaoh kept his own in that district. It was also separate from Egypt, and therefore fittest for Jacob and his family, which would be out of all danger of interfering with the Egyptians.

GOSHEN, in *Geography*, a township of America, in the county of Hampshire, and state of Massachusetts, between Cummington and Conway; 14 miles N. of Northampton; incorporated in 1781, and containing 724 inhabitants.—Also, a township in Vermont, lying partly in Addison county, and partly in Caledonia, adjoining to Sahbury on the west.—Also, a township in Chester county, Pennsylvania, containing 966 inhabitants.—Also, a town in Litchfield county, Connecticut, famous for the production of excellent cheese, containing 1493 inhabitants; 7 miles N.W. of Litchfield.—Also, the most considerable town in Orange county, New York; about 58 miles N. of New York city. Its situation is pleasant, and it contains about 60 or 70 compact houses, an academy, court-house, gaol, and Presbyterian church. The township contains 2563 inhabitants.—Also, a place in London county, Virginia, where is a post-office; 37 miles from Washington.—Also, a town in Kennebec county, Maine, containing 270 inhabitants.

GOSNICK CR. a river of New Jersey, which runs into Delaware bay. N. lat. 39° 15'. W. long. 74° 54'

**GOSIIGOSBINK**, a Moravian settlement in Pennsylvania, situated on Alleghany river, about 15 miles above Fort Franklin.

**GOSIR**, a town of Arabia, in Hadramaut, near the coast; 75 miles S.W. of Kefchim.

**GOSLING**, a town of Austria; 12 miles S.E. of Davarn in Waldhoven.

**GOSLINGS**, the name given to young geese.

**GOSPEL**, a history of the life, actions, death, resurrection, ascension, and doctrine of Jesus Christ.

The word is Saxon, and of the same import with the Latin term *evangelium*, or the Greek *ευαγγελιον*, which signifies *good tidings*, or *good news*; the history of our Saviour being the best history ever published to mankind. This history is contained in the writings of St. Matthew, St. Mark, St. Luke, and St. John, who from thence are called Evangelists. (See each of these articles.) The Christian church never acknowledged any more than these four gospels as canonical; notwithstanding which, several apocryphal gospels are handed down to us, and others are entirely lost.

We shall here subjoin the titles of some of the principal of these apocryphal gospels, as we find them in Jones's Canon, and Lardner's Works, with remarks that will serve to enable us to distinguish them from our four gospels, the authenticity of which is evinced under other articles in this work. (See **BIBLE**, **CANON**, and **TESTAMENT**.) Several of these spurious gospels are mentioned in the decree, ascribed to pope Gelasius, in the council of Rome, A. D. 494, which pronounced them to be apocryphal. The gospel of "Andrew the Apostle," is only mentioned in this decree. No fragments of it are extant, nor are there any testimonies concerning it. The gospel of "Apelles" is not mentioned by any writer before Jerom, who places it among the apocryphal pieces of the New Testament. Apelles was a disciple of Marcion, flourished about the year of Christ 180, and is supposed to have formed this gospel out of the true and genuine gospels for the use of his followers at the close of the second century. The gospel, "according to the twelve apostles," is mentioned by Origen, Ambrose, and Jerom, but they unanimously concur in rejecting it, and in expressly asserting that the church receives only four gospels. Jerom supposes that it has been the same with the gospel according to the Nazarenes. The gospel "according to St. Barnabas" is not noticed by any of the Christian writers of the first four centuries; nor do there seem to be any fragments extant, that unquestionably belong to it. Mr. Jones apprehends that this was merely some interpolated corrupted gospel of St. Matthew. The gospel of "Bartholomew" is mentioned by Jerom as apocryphal, and Jones, for reasons which he alleges, inclines to think, that it was the same with the gospel of St. Matthew, used by the Hebrews or Nazarenes. M. Daille is of opinion that it was forged but a very little time before Gelasius. The gospel of "Basilides" is named by Origen, Ambrose, and Jerom, among the apocryphal books of the New Testament; but no fragments of it remain. The gospel of "Cerinthus" is mentioned only by Epiphanius in connection with an exposition of the first words of St. Luke's gospel, as many other Christian writers notice the apocryphal books; and it seems probable, from the similarity of the opinions adopted by Cerinthus and the Ebionites, that the gospel of Cerinthus and his followers was no other than the Ebionite or Nazarene gospel, i. e. the gospel of St. Matthew corrupted and interpolated, in Hebrew. The gospel "according to the Egyptians," was one of the most celebrated apocryphal books, and supposed even by several modern critics to have been a faithful compendium

of some Catholic Christians in Egypt, before either of the four canonical gospels now received. The first Christian writer who cites it is Clemens Alexandrinus, who, however, rejects it, though some have supposed that a passage in the second epistle of Clemens Romanus to the Corinthians is taken from this gospel. It is mentioned by Origen, Jerom, and Epiphanius among apocryphal books. Many modern writers, as Erasmus, Grotius, Grabe, Mills, suppose, that it is referred to in the introduction to St. Luke's gospel, and therefore that it was prior to his; and Dupin and F. Simon think, that though it is not of the same authority with the four canonical gospels, it ought not to be rejected. Mr. Jones is of opinion, that it was composed by some very early heretics to support their doctrines of celibacy and abstemiousness, and very probably by those of Egypt; and Dr. Lardner thinks that it was not written before the third century. The gospel of the "Ebionites" was either altogether, or very nearly, the gospel of the Nazarenes. The gospel of the "Encratites" has been mentioned by Fabricius and some others, but there is reason for doubting whether any gospel was ever called by this name. The gospel of "Eve" has been mentioned by several modern writers, but only by Epiphanius among the ancients; it was, without doubt, a forgery of the Gnostics. The gospel of the "Hebrews" was the same with that of the Nazarenes. The gospels of "Helychius" were some interpolated copies of our received gospels. The gospel of "Judas Hecariot" is mentioned by Irenaeus and Epiphanius as peculiar to one of the most monstrous and inconsistent sects that ever assumed the Christian name. The false gospels of "Lucianus," who was a famous critic and martyr under Dioclesian, were, like those last-mentioned, corrupted, interpolated copies of our present gospels. The gospel of "Matthias," of which there are now no remains, is mentioned by several of the most celebrated writers among the ancients, *viz.* Origen, Eusebius, Ambrose, and Jerom; but they all represent it as apocryphal. The gospel of "Marcion" is taken notice of by Tertullian and Epiphanius, but it appears to have been one of our own gospels, mutilated and altered; probably that of St. Luke, from which he took away entirely the two first chapters, and many other parts, inserting many things of his own, with a view to favour the opinions he had adopted. The gospel of the "Nazarenes" or "Hebrews" is the most famous of all the ancient gospels. Some have supposed that St. Paul refers to this gospel, Gal. i. 6. It is cited by Ignatius, as some have supposed, by Clemens Alexandrinus, by Origen, by Eusebius, by Epiphanius, by Jerom; and it is mentioned by Bede, Sixtus Senensis, Baronius, Casaubon, Grotius, F. Simon, Dupin, Grabe, Toland, Nye, Richard Mill, Fabricius, Mangey, and other modern writers. However it is alleged, that this gospel was never received by any primitive writer as canonical, nor was it cited or appealed to, as of any authority, by any one writer of the first four centuries; and moreover that it was composed out of St. Matthew's and the other authentic gospels, with additions of some other things received by oral tradition. It is allowed, that it was an early composition, and Mr. Jones says, that it was undoubtedly extant in the beginning of the second century, and seems to have been made by some converted Jews, to favour their notion of blending judaism and christianity together. "As many mistakes," says Dr. Lardner, "have been entertained about the 'gospel according to the Hebrews,' it may not be unreasonable to observe here, that probably it was an Hebrew translation of St. Matthew's original Greek gospel, with additions from the other gospels; to which possibly might be added some few particulars received by tradition from the early Jewish believers."

believers." (See EBIONITES and NAZARENES.) This excellent writer elsewhere observes, it is not necessary for us to suppose, that the ancient fathers who mention other gospels, thought, "that all, if any of those gospels, were written before St. Luke's, or that he spoke of them; for Basilides and Apelles could not write gospels before the second century: and they might suppose, that several, if not all the others, mentioned by them, were written after St. Luke's. The meaning of what these ancient writers say is, that the church receives four gospels only. There were many others. But to them may be applied the words of St. Luke; they only took in hand, or attempted. They did not perform, as Matthew, and Mark, and Luke, and John did. And they might express themselves in that manner concerning gospels written after St. Luke's, as well as before it."

The gospel of "Peter" has been taken notice of by many of the ancient writers, as Serapion, Tertullian, Origen, Eusebius, and Jerom. Some have supposed, that this was the gospel of St. Mark, who was the companion of Peter, and wrote the gospel now extant under his name. But there is reason for believing that the gospel of Peter was different from that of St. Mark. It is not very certain by whom it was forged. Dr. Grabe, and after him, Dr. Mill, suppose it to have been made by Leucius, whom they reckon to have been a heretic of the second century: but Leucius did not live till the latter end of the third, or the beginning of the fourth century; whereas this gospel appears to have been extant in the second century, as we may infer from the account of it by Serapion, who was bishop of Antioch in the 11th year of the emperor Commodus, *i. e.* A. D. 190. Mr. Jones apprehends, that this gospel was composed by those ancient heretics in the second century, called *Docetæ* (see that article); and he conjectures that the gospel of Basilides, above-mentioned, was either wholly, or in a great measure, the same with this apocryphal gospel under the name of Peter. The gospel of "Perfection" was one of the numerous forgeries of the Gnostics, who pretended to a greater perfection in knowledge and virtue than all others, and hence took their name. (See GNOSTICS.) The gospel of "Philip" was another forgery of the same persons. The gospel of "Seythianus" was composed by him who was the source and author of the Manichean heresy. The gospel of "Tatian" was no other but a harmony of four gospels, or a sort of epitome of the whole history contained in our four gospels. The gospel of "Thaddæus" is merely mentioned in the decree of pope Gelasius. The gospel of "Thomas," or the gospel of the "Infancy of our Saviour," is mentioned by Origen, Eusebius, Cyril, Ambrose, Athanasius, and Jerom, and is unquestionably apocryphal; though this is different from the gospel of Thomas. One of the followers of Manes, the head of the Manichees, for Origen, who mentions the former, lived a considerable time before the Manichean heresy was divulged. The gospel of "Truth" was a forgery of the Valentinians in the second century. This is supposed by some to be the same with the gospel of "Valentinus," but others are of opinion that he had a gospel of his own, different from that called the gospel of Truth used by his followers. For further particulars we refer to Jones's Canon and Lardner's Works.

GOSPINI, in *Geography*, a town of the island of Sardinia; 24 miles S. of Oristagni.

GOSPORT, is a sea-port town of Hampshire, England. In the time of king Henry VIII., when he visited this part of the island, Gosport was only a poor village inhabited by fishermen, but it has gradually become a town of considerable extent and importance; and of late years has been

regularly fortified on the land side by a line of bastions, redoubts, counter-scarps, &c. that extends from Weovil to Stoker, or more properly, Alvertoke lake. Within the works on the Weovil side, are the king's brewery and cooperage, with an immense range of storerooms for wine, malt, hop, &c. This place communicates with the sea by means of a large basin and canal, with extensive quays, where vessels of considerable burden can take in their stores. Many small boats belonging to Weovil are employed in the conveyance of wine, beer, and water, to the ships in the harbour. On the Weovil side are also the new barracks, an extensive range of buildings, with every convenience for a great number of soldiers. Gosport, considered as a sea-port, is handsomely built, and the police well regulated. The town is a chapelry to the neighbouring village of Alvertoke: the chapel is a spacious edifice, standing in a large well-planted cemetery, to the south of the town; the interior neat, and disposed into a middle and two side aisles. The work-house for the poor is a large, airy, and commodious building. Here are also several charity-schools; and four almshouses for distressed widows. The markets are held three days weekly, and are much frequented: fish and vegetables are sold in great abundance; the latter being brought, not only from a considerable distance inland, but also from the Isle of Wight. Two fairs are held annually. Several breweries are established; and a very extensive iron foundery, where numerous articles are manufactured for government. Gosport is 78 miles distant from London: the population of the parish of Alvertoke, including the inhabitants of this town, was returned, under the act of 1801, at 11,295; the number of houses being 1926. The connection between Gosport and Portsmouth is preserved by numerous ferry-boats that ply across the harbour, which in this place is about three quarters of a mile in width.

At a small distance south of Gosport is the Royal Hospital of Hasler, built between the years 1746 and 1762, for the reception of sick and wounded seamen, on the earnest recommendation of the late earl of Sandwich. It is situated within 400 yards of the extremity of the point of land which bounds the west side of the entrance to Portsmouth harbour; and consists of an extensive front, and two wings, each comprising two distinct ranges of buildings. In this hospital upwards of 2000 patients can be accommodated; the regular expence of the establishment in salaries, &c. is above 5000*l.* annually.

Nearly a mile south-west from Hasler hospital is Fort Monkton, a modern and regular fortification, exceedingly strong, and defended by thirty-two pieces of heavy ordnance; to the westward, ranges a strong redoubt; and this, together with the fort, effectually secures this part of the coast. On the shore, to the eastward, a high and massive stone wall has been erected, to preserve the land from the ravages of the sea.

Near the extremity of the neck of land which terminates the entrance of the harbour on the east side, is the Black house, a very strong fort, defended by a formidable battery. *Auties of England and Wales, vol. vi.*

GOSMART, formerly called *Agardara*, a fishing town of America, on Star Island, belonging to Rockingham county, New Hampshire, containing 85 inhabitants; about 12 miles E. S. E. of Piscataqua harbour.

GOSS, in *Rural Economy*, a term occasionally applied to the common wool in different places, and which is sometimes written *goss*. See *FENCIB*.

GOSSAINGUNGEE, in *Geography*, a town of Hindoostan, in Oude; 15 miles S. E. of Lucknow.

GOSSAMER is the name of a fine filmy substance, like cobwebs,

cobwebs, which is seen to float in the air, in clear days in autumn, and is more observable in stubble-fields, and upon furze and other low bushes. This is probably formed by the flying spider, which, in traversing the air for food, shoots out these threads from its anus, which are borne down by the dew, &c.

**GOSAMPINUS**, a name given by Pliny and the ancients to a tree growing in the East Indies, which produced a sort of cotton, the threads of which were too short to be spun or carded; so that it served only for the stuffings of beds and the like, for which it was very proper, being very light and soft. It was in some esteem in medicine also, to recal the heat and spirits into parts to which it was applied. It is called by Piso *arbor lanigera*, the wool-tree, and had its ancient name from the words *gossipium*, cotton, and *pinus*, the pine-tree, being somewhat like the pine in external appearance, yet bearing a sort of cotton.

**GOSSE-ABDIAH**, in *Geography*, a town of Nubia, on the Tacazé; 90 miles S. of Jalae.

**GOSSEC**, M. in *Biography*, a voluminous French musical composer of the old school, almost the only lineal descendant of Lulli and Rameau. He had force, fire, and knowledge; but his style was not that of the present day, either in Italy or Germany, nor could his friend, M. La-borde, persuade us, that "true genius is in need of no school or model. In whatever nation a man of genius may be born, he will make himself known, and not march with less firmness, though without a guide, in the road to glory. Celebrated schools cannot give genius, that is the boon of nature, and nature wants no school." *Essais sur la Mus.*

Unluckily, nature alone has never made an artist. A good painter, poet, or musician, can never be made without education, study, and models. Ingenious works have been produced by dint of genius, but never faultless. The awkwardness of self teaching will always appear; and taste, elegance, facility, grace, and often learning, will be wanting to render them perfect.

**GOSSEINS**, in *Geography*, a town of Thibet, on the Dewah. N. lat.  $30^{\circ} 30'$ . E. long.  $81^{\circ} 24'$ .

**GOSSELIES**, a town of France, in the department of Jemmapes, and chief place of a canton, in the district of Charleroy. The place contains 2872, and the canton 12,894 inhabitants, on a territory of 100 kilometres, in 17 communes.

**GOSSIPIUM**. See **GOSSYPIMUM**.

**GOSSLAR**, in *Geography*, a town of the kingdom of Westphalia, on the Gose, which runs near this place into the Oekar. It was a free and imperial town, having on one side the bishopric of Hildesheim, and on the other the principality of Wolfenbuttle. It was founded in the year 922, by Henry the Fowler, and part of it re-built after being destroyed by fire in 1728. It has four parish churches, two chapels, and two Lutheran convents. Its principal trade arises from the mines of iron and lead in the Rammel mountain near it; 30 miles S. of Brunswick. N. lat.  $51^{\circ} 55'$ . E. long.  $10^{\circ} 26'$ .

**GOSSUM**, a swelling of the thyroid gland. See **BRONCHOCELE**.

**GOSSWEINSTEIN**, or **GOSSMANSTEIN**, in *Geography*, a town of the bishopric of Bamberg, on the Putlach, 20 miles E. S. E. of Bamberg. N. lat.  $49^{\circ} 45'$ . E. long.  $11^{\circ} 10'$ .

**GOSSYPIMUM**, in *Botany*, the Cotton plant. The name is supposed by the learned to be of Egyptian origin, and if so, is akin to *Cotnemesgiar*, or *Gatnemesgiar*, the evident source of our word Cotton, which is given as the Egyptian appellation of the plant in Alpinus, de Plantis

*Ægypti*, 71. Pliny makes it a Latin word, though the more common name he says is Xylon; the Greek *ξύλον*.—Linn. Gen. 355. Schreb. 468. Willd. Sp. Pl. v. 3 803. Cavan. Diff. fasc. 6. 309. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 2. 453. Juss. 274. Lamarck. Illustr. t. 586. Gærtn. t. 134. (Xylon; Tourn. t. 27.)—Class and order, *Monadelphia Polyandria*. Nat. Ord. *Columnifera*, Linn. *Malvaceæ*, Juss.

Gen. Ch. Cal. Perianth double: the outer of one leaf, three-cleft, flattish, largest: inner of one leaf, cup-shaped, with five blunt notches. Cor. Petals five, inversely heart-shaped, flat, spreading, attached to the tube of the stamens by their base. Stam. Filaments numerous, connected in their lower part into a tube, separate and lax above, inserted into the corolla; anthers kidney-shaped. Pist. Germen superior, roundish; style columnar, as long as the stamens; stigmas three or four, oblong, thickish. Peric. Capsule roundish, pointed, with three or four cells and as many valves, with contrary partitions. Seeds numerous, oval, fringed and enveloped with long wool.

Ess. Ch. Calyx double; the outer three-cleft. Capsule with three or four cells. Seeds enveloped in wool.

The species of Cotton, like those of all plants cultivated from the most remote antiquity, in various countries, for economical purposes, are extremely difficult to define, and obscured by numerous varieties.

Linnæus in Sp. Pl. ed. 1, defines three species only,

1. *G. herbaceum*. Camer. Epit. 203. Cavan. t. 164. f. 2, supposed to be a native of the Levant, East Indies, and Africa, and generally cultivated in those countries for its produce.—Leaves five-lobed, pointed, with one gland beneath. Stem herbaceous, nearly smooth.—This is annual, with a bushy, branched, often zig-zag stem, smooth or only slightly downy. Leaves cut half-way down into three principal, and two smaller lateral, pointed rounded lobes. The mid-rib bears one gland at its back, about half an inch from the stalk. Flowers yellow, purple at the base. Capsule the size of a walnut, enveloped in the calyx like a silberd.

2. *G. barbadense*, taken up from Plukenet, t. 188. f. 1. Leaves three-lobed, entire, with three glands beneath.—Supposed to be a native of Barbadoes. It is at least one of those cultivated in the West Indies. The plant is in all its parts larger than the foregoing; lobes of the leaves not near so deep.

3. *G. arborescens*. Cavan. t. 165. Pluk. t. 188. f. 3. (Cudu-pariti; Rheede Hort. Mal. v. 1. 55. t. 31.)—Leaves palmate, five-lobed; lobes lanceolate. Stem shrubby.—Native of the East Indies in a sandy soil. The woody perennial stem, and deep-cut long-lobed leaves, whose mid-rib bears one gland, distinguish this. The flowers are reddish. The cotton is used in manufactures. Willdenow erroneously quotes Alpinus here.

His *Cotnemesgiar* is in the Plant. Ægypti. t. 71, not his Exot. t. 38, and does not agree with the East Indian plant.

To these is added in Sp. Pl. ed. 2. 975,

4. *G. hirsutum*. Cavan. t. 167. Leaves with three or five acute lobes. Stem branched, hairy.—The synonym of Tournesort is wrong.—This is said to come from America. It appears to us a hairy variety of the first, for the gland on the mid-rib, which Linnæus thought an exclusive mark of *hirsutum*, is found in both.

What Linnæus intended by *G. religiosum*, Syst. Nat. ed. 12. v. 2. 462, is rather doubtful. He defines it—"Leaves three-lobed, acute, with one gland beneath. Branches dotted with black."—We have an East Indian plant which answers to this definition, but it does not exactly agree



agree with what he has marked *religiosum* in his own herbarium, which appears to us *barbad nje*; though it may be what he had in his garden.

With the *latifolium* of Murray, *Comm. Gott.* for 1--6. t. 1, we are unacquainted—Cavanilles figures and describes several more species, especially *G. trifolium*, t. 166, a noble plant, from Commerçon's herbarium, gathered in the Mauritius—Willdenow, adopting these, reckons ten species in all, but the synonyms of the whole genus require revision.

GOSTADT, JOSTADT, or *Joséphstadt*, in *Geography*, a town of Saxony, in the circle of Erzgebürg; 23 miles S. of Chemnitz. N. lat. 50° 26'. E. long. 13° 2'.

GOSTIN, a town of the duchy of Warlaw; 48 miles N.N.W. of Rawa.

GOSYTULLA, a town of Bengal; 22 miles E. of Kishenagar.

GOTARA, a town of Hindoostan, in Bahar; 57 miles S.S.W. of Patna.

GOTERON, a valley of Switzerland, in the canton of Friburgh, on the N.W. of the town of Friburgh, near the bridge leading to Bern, takes its name from the Goteron, a small rivulet; it is extremely narrow, and above two miles in length, and is bounded on each side by overhanging rocks of sandstone. Vernet, the celebrated landscape painter, studied these rocks with great attention, and frequently declared that, excepting those of Tivoli, he never saw any whose varying tints had a more pleasing and harmonious effect. The valley contains several mills, an iron foundery, where the ore brought from Franche Comté is forged, and a manufacture of linen and cotton, established by some merchants of Neuchâtel, under the protection and encouragement of government.

GOTH, STEPHEN, in *Biography*, archbishop of Upsal, in Sweden, in the 16th century, concurred in the measures adopted by king John, to restore and re-establish popery in that kingdom. With this view he fashioned a new liturgy, which, under the pretence of bringing the Lutheran church nearer to the simplicity of the earlier ages of the gospel, artfully assimilated the doctrines and ceremonies of worship to those of Rome, with the omission of some particular forms and expressions which would have too plainly disclosed the object in view. This liturgy was ordered to be used in all the churches. The king's brother Charles, and the clergy within his jurisdiction, were alarmed at this attempt, and they so effectually roused the jealousy and excited the fears of the people, and of the states, that after repeated efforts to carry his point, which introduced great confusion into the kingdom, and had nearly produced a civil war, the king was obliged to relinquish his scheme, and the liturgy was suppressed. It has long since become an object of curiosity among collectors, and is entitled "*Liturgia Suceanzæ Ecclesiæ cum præfatione et notis Laurentii Upsalienfis Episcopi*," 1576. Univer. Hist.

GOTHA, in *Geography*, a principality of Germany, in the circle of Upper Saxony, bounded on the N. by the electorate of Saxony, on the E. by the duchy of Weimar, on the S. by the county of Henneberg, and on the W. by the principality of Eisenach. The duchy contains 12 towns, and more than 200 churches: it abounds in grain and fruit, and the southern division contains part of the forest of Thuringia, and some mine works. The state consists of three classes, *viz.* counts, nobility, and some barons, convoked by the prince. The reigning duke maintains a guard of 1600 men, two regiments, each of which is composed of 800 men, and a corps of artillery. The chief rivers are the Leine and the Neisse.

The capital of the principality of the same name is seated

on an eminence near the Leine, which supplies the town with water, conveyed by stone-canal, and is one of the best and handsomest towns in Thuringia. It has a hospital for the soldiers, two schools for their children, and barracks, in which the military art is taught; it has likewise a powder-dery for cannon, ball, &c. two churches, a good academy, a house of correction, an hospital for widows, and a school for orphans. The inhabitants carry on a considerable trade in wool and woollen manufacture, and beer; and they derive benefit, not only from the agriculture of the vicinity, but from the passengers that traverse through it from Lipsick to Upper Germany. The residence of the duke, called Friedenstein, stands on a hill above the town, and contains an armoury, a valuable library, a museum of natural curiosities, and an excellent cabinet of minerals; 13 miles S.W. of Erfurt. N. lat. 50° 57'. E. long. 10° 49'.

GOTHA, a river of Sweden, which rises from the southern extremity of the lake Wenner, near Wennerborg, and after a course of 70 miles, falls into the sea near Gotheborg. In most places this river flows with a gentle current, and in a narrow channel, and is navigable only in some parts of its course for small craft of 20 tons burden. If it could be rendered navigable through its whole course, the Wenner lake might be joined with the German ocean; but as numerous shoals and cataracts intervene, the communication has been attempted by the Carlgraf canal, the canal of Trölbatta, and the sluices of Akerstram and Edet. About 12 miles from Gotheborg the river Gotha divides into three branches: two unite again after encircling a small rock-*island*, crowned with the fort of Bohus, formerly deemed impregnable; the stream formed by the union of the two branches is called the Northern river, and falls into the sea after a course of 10 miles. The third branch retains the original name of Gotha; and the space included between the Northern river and the Gotha is named the island of Hisingen.

GOTHARD, Sr., a town of Hungary, near which the Turks were defeated by the Christians, in the year 1694; 21 miles W. of St. Croit.

GOTHARD, St. a chain of mountains of Switzerland, in the canton of Uri, the summit of which rises above the sea 9075 feet, though some have estimated its height to be much greater. The particular parts of this chain are called by different names; of which the principal are the Salla, Profa, and Surecha, to the east; the Feudo, the Patina, and the Locendro, to the west; to the north, the Urfino; and to the south, the ridge of naked and piked rocks of the Val-Malgia. Of these, the Feudo is the highest. There are six pastures on the neighbouring heights, on which are fed 200 cows, 150 goats, and 30 horses. The river Tosi has three principal sources in the chain of St. Gothard: the first springs near the foot of the Profa, the second is the lake of La Salla, in another part of the eastern chain, and the third is furnished by the snows of mount Feudo. These three sources uniting with another branch, that flows from the Trecca, through the valley of Belmonte, form one great stream, which takes its course towards the south, enters the lake of Locarno, and traversing part of the Milanese, falls into the Po. The source of the Reuts is the lake of Locarno, an oblong piece of water, about three miles in circumference, stretching between the mountains of Patina and Locarno, and almost entirely supplied by the mountain glaciers which crown the summit of the Locendro. The stream arising from this lake rushes down the valley of St. Gothard, and joining in the vale of Urfino, the two branches which rise from the Feudo on one side, and from the Grisen mountains on the other, flow towards the north into the lake of La-

corn, and from thence throws itself into the Aar. The valley of St. Gothard is exceedingly dreary. It does not contain a single field, nor produce a single tree; and the sides of the mountains are barely sprinkled with short herbage.

Mount St. Gothard affords one of the best Alpine passages from Germany and Switzerland to Italy. The Romans were acquainted only with that over the Great Bernhard and Septimer. The Gothard was called by them sometimes Adula, sometimes the *High* and *Leventine Alps*. The present road over this mountain begins at the village Hospital, in the Ursern valley, and terminates on the south side, at Airole: its breadth is from ten to twelve feet, and it is covered with large pieces of granite.

The first attempt of passing over the Gothard in a travelling carriage, was successfully made in the month of July, 1775, by the late Mr. Greville, the gentleman to whose early exertion in collecting and in employing persons well qualified to assist him, we owe the extensive assemblage of minerals lately purchased by government for the British museum.

Though, in the high Gothard valley, the temperature is seldom below 19° of Reaumur, yet, on the N. side of the mountain, the climate is sufficiently rough to make the growth of trees cease at the height of 4566 feet. Among a vast number of plants common to the Alps in general, we find here, as peculiar to mount Gothard, the *Viola minima*, and *Campanula patula*.

But most interesting is this mountain in regard to its mineral substances, and its geognostic structure in general: for, respecting the former, it may be said, that there is scarcely any where a tract of country known, that, within the same extent of space, affords so considerable a variety of them. This is not the place for enumerating all these fossils; we should, however, not omit mentioning, that the *tremolite*, which has received its name from the valley of Tremola, is, according to Ebel, not found there, but deeper down the mountain, in the Leventine valley. See TREMOLITE.

The St. Gothard consists entirely of primitive rocks, which, however, display great variety in their mixture. On the N. side veined granite, gneiss, mica-slate; in the plain of the rocky valley, where the Hospitium stands, granite of large grain, traversed by beds of veined granite and mica-slate; from the summit downwards, on the S. side, massive granite of large and small grain alternately, veined granite, mica-slate; in the Tremola valley, on the Fiedo and Sorella, hornblende-slate commences, mixed in some places with fine granular quartz, in others with feldspar, and lower down with fine reddish-brown, dodecahedral garnet; over which beautiful rock the road winds, through the Pfostella forest, down to Airole. On the N. side, in the Ursern valley, among the just mentioned rocks, runs pot-stone on the S. S. E. part of the valley, and on the N. N. W. primitive lime-stone and clay-slate; while the S. side in the Leventine, Canaria, and Piora valleys, exhibits primitive lime-stone and gypsum.

All rocks of the Gothard are disposed in strata, having a direction from E. N. E. to W. S. W., and from N. E. to S. W. which is best observed between Hospital and Airole, where the road makes a transversal section, almost through the whole of the central chain. The regularity of the stratification of the granite is most striking in the neighbourhood of the Ruduat bridge: the strata are from three to four inches thick, and have their direction from N. E. to S. W. Likewise, on the Prosa and Fiedo, and southward from Hospital down the valley of Tremola, the primitive lime-stone and gypsum, which pass on the S. side of the mountain through the Leventine, Canaria, and Piora valleys, and the lime-stone, clay-slate, and pot-stone, seen on its N. side,

in the Ursern valley, are the continuations of the same formations that range through the whole of the Pays de Vaud.

The ridges of mountains constituting the Gothard are exceedingly broken, and bear the marks of causes the most destructive; nor is it improbable that they were infinitely higher in ancient times, and that, at the period of the Romans, they were not unaptly called the *Highest Alps*. The upper rocky valley, where the Hospitium is situated, is covered with numberless pieces of rocks, which are all precipitated from the surrounding peaks. The great proportion of a small grained granite, among the rocks of the Gothard, are the probable causes of this extraordinary devastation. The upper, nearly circular, rocky valley, was in former times completely shut on all sides: the remains of the rocks that formerly filled the chasms are still distinctly seen on the N. side, near the bridge over the Ruduat, where the Reufs forms a beautiful fall; and on the S. side, below the Hospitium, the rocks approach each other so closely, that the violent action which produced the present chasms is sufficiently evident. Before that revolution happened, it is highly probable that this considerable valley formed a deep lake; nor is it less so, that the Ursern-valley, before the Devil's mountain was broken through, and the upper Leventine valley, before the Platifer, near Dazoo Grande, was rent asunder, presented deep seas of considerable extent.

GOTHEBORG, a town of Sweden, in West Gothland, distinguished by a commodious port, and standing near the seite of Lodefe, a town built by Gustavus Vasa, which, being endowed with singular privileges, soon became the great emporium for the trade of the western provinces. Charles IX., when duke of Gothland, having, in 1604, laid the foundations of a new town in the island of Hisingen, not far from Lodefe, called it Gotheborg, in honour of his duchy. On his accession to the throne, he erected in his new town a trading company; drew thither many foreigners, particularly the Dutch, to whom he allowed an exemption from all duties of export and import during twenty years; established a corps of English and Scots troops, and granted to the Calvinists the free exercise of their religion, the first place in Sweden where this toleration was permitted. By these means Gotheborg soon became a flourishing port, and, next to Stockholm, the most commercial town in Sweden. In 1611 it was reduced to ashes by the Danes, and afterwards rebuilt in the reign of Gustavus Adolphus on the present seite, and obtained a confirmation of its ancient rights, with a grant of several new privileges.

Gotheborg is built in a singular situation. At a small distance from the sea is a marshy plain, not more than half a mile in breadth, watered by the river Gotha and Moldal, and almost inclosed with high ridges of bare and rugged rocks. Gotheborg stands partly on the ridges, and partly in the plain, and is divided into the upper and lower town. The latter is entirely level, intersected by several canals, and the houses are constructed on piles: the upper part hangs on the declivities, and rows of buildings rise one above the other like the seats of an amphitheatre. The whole is regularly fortified; and the circumference is near three miles, exclusive of the suburbs, called "Haga," which lie towards the harbour. The streets are uniformly straight; some few of the houses are of brick, but most of them are constructed of wood, painted red. The harbour, formed by two chairs of rocks, is about a quarter of a mile in breadth; and the entrance is defended by the fort of New Elfsborg, which stands on a small rocky island, and contains a garrison of 250 men.

A royal society of sciences and literature has been lately established

established in this town, on the plan of that of Upsal. The acts, written in the Swedish tongue, and printed in 8vo. contain disquisitions on various subjects, in the several branches of science, natural history, antiquities, history, and polite letters. The population amounts to 20,000 persons, in consequence of an increase, occasioned by the extension of its commerce, particularly on account of the East India company, and the success of the herring fishery. The East India company was established in 1731, and on account of the ice, which closes the port of Stockholm, in the gulf of Bothnia, at the proper season of the departure of ships for the East Indies, the company carries on its commerce from Gothenburg, whose harbour, lying in the German ocean, is more commodious. In 1745, the herrings, which had not hitherto usually approached the western shore of Sweden, flocking in shoals, the inhabitants of Gotheborg established a fishery, which has been very lucrative. The fishery begins in November, and though it continues scarcely three weeks, it supplies the fishermen of Gotheborg with not less than 600,000 barrels. Of these, 200,000 are salted, and train-oil is drawn from the remainder; fifteen barrels of herrings yielding one of oil, which is principally exported to Holland and Spain. One barrel of salt, procured from Spain, cures three barrels of herrings: the average exportation of salted herrings may be estimated at 150,000 barrels, and the inland consumption of Sweden at 50,000. An English consul and factory reside at Gotheborg; and a chapel, with a regular chaplain, is appropriated for their use. The fortifications of Gotheborg are so weak, that in the year 1788 it must have fallen into the hands of the Danes, if foreign powers had not interfered. N. lat. 57° 40'. E. long. 11° 44'. Cox's Travels in Sweden.

**GOTHIC**, or **GORMEK**, something that has a relation to the Goths, an ancient people, originally inhabiting that part of Sweden called Gothland; whence they spread themselves over Greece, Dalmatia, Bulgaria, Italy, Spain, &c. See **GOTHIS**.

**GOTHIC Architecture**, a term of reproach to denote one or more kinds of architecture which prevailed during the middle ages. It seems to have been invented by the restorers of the Grecian orders in Italy, about the middle of the 16th century, to signify every preceding species of European architecture not conformable to them, and it was imported in the same sense into England by Mr. Evelyn and sir Christopher Wren, though the latter appears sometimes to confine the term to the pointed style, in which particular he is followed by the greater part of late writers. Mr. Evelyn, quoted by sir Christopher Wren, in his "Parentalia," says: "Gothic architecture is a congection of heavy, dark, melancholy, monkish piles." In the same sense, sir Christopher himself, speaking generally of what he terms Gothic architecture, calls it "Mountains of stone; vast, gigantic buildings, but not worthy the name of architecture. This we now call the Gothic manner; so the Italians called what was not after the Roman style." In opposition to the idea which this eminent architect here gives of the architecture in question, he, in another part of his Parentalia, describes the inventors of it as "setting up slender and mis-shapen pillars, or rather bundles of staves and other incongruous propp, to support ponderous arched roofs without entablature." In conformity with this latter notion of sir Christopher, Mr. Kions, a professional writer, says: "Modern Gothic is distinguished by the lightness of its work, the excessive boldness of its elevations and of its sections, by the delicacy, profusion, and extravagant fancy of its ornaments." The same confusion of language, if not of ideas, prevails amongst the admirers of the Gothic style, so called, as

amongst the declared foes of it. The late poet laureat, Thomas Warton, who has written a great deal on the subject, and who had planned a "History of Gothic Architecture," speaking of Salisbury cathedral, expressly deems that it is in the Gothic style, while two other celebrated writers in the same line, the Rev. James Bunting and Carl Grols, as positively affirm that this cathedral is "entirely in the Gothic style." The perplexity and uncertainty of an ordinary reader must necessarily be increased by the different senses in which the terms, ancient architecture, modern architecture, Saxon architecture, Norman architecture, and English architecture, are now used by different writers. To clear up this confusion, and to present distinct and clear ideas on these much agitated subjects, it seems best to treat them in an historical manner.

It is demonstrable that the regular orders of Grecian architecture were upon the decline throughout the Roman empire after the reign of the Cæsars, and still more so after that of Constantine the Great. A century before the Ostrogoths over-ran and subdued Italy, the Visigoths, Spain, the Huns, Germany, the Vandals, the Roman provinces of Africa, the Franks, France, and the Saxons, Britain. These several barbarians destroyed innumerable monuments of architecture as well as of the other arts, but they none of them introduced a style of building different from that which they found practised in the conquered countries. They did not instruct the ancient inhabitants to build in a new manner; on the contrary, they learnt of them so much of the art as they actually acquired. But the art itself being vastly degraded in the fifth and sixth centuries, and those warlike hordes not being very apt scholars, it is no wonder their first structures were executed in a rude and heavy style. Still nothing is more groundless than to speak of Gothic architecture in the manner of Mr. Evelyn and sir Christopher Wren, as of a style of building invented or introduced by the Goths. The fact is, the heavy circular manner of building which prevailed throughout Christendom, from the fall of the Roman empire, in the fifth century, down to the twelfth century, was the Roman, or, what is the same thing, the Grecian style, increased and rudely executed. Amongst us it is called the Saxon style, because it prevailed during what is called the Saxon period or dynasty in South Britain; but the first teachers and the models of it were both of them strictly Roman.

On the first introduction of Christianity amongst our Saxon ancestors, at the conclusion of the sixth century, they consecrated many of the existing Pagan temples to the Christian worship, according to the instructions which they received to this effect from pope Gregory the Great, and they ran up other temporary oratories of wood or whittles, as we learn from Bede, and other original historians. Very soon, however, the same Roman missionaries, who converted them, taught them to build churches of stone after the Roman manner; for this denomination of it, *the Roman manner*, (*more Romano*;) is always mentioned by the aforesaid historians. The first archbishop of the Northumbrians, Paulinus, who was a Roman monk, appears to have been the chief architect amongst the English Saxons at the beginning of the seventh century. He built churches of stone at York, Lincoln, and other places. His next successor but one, Wilfrid, was an Englishman, who not only equalled but greatly surpassed his master in architecture. For the churches which he built at Rippon and at Hexham were long celebrated for being the finest buildings of their kind north of the Alps; but then it is expressly recorded, both of him, and his rival in architecture, Benedict Biscop, abbot and founder of the church and monastery of Wearmouth;

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mouth, that they made different journeys to Rome, and studied the architecture of the church of St. Peter's and other churches there, and that they even hired workmen from thence to execute their works in England. Thus it evidently appears, that the style of architecture, which is called the Saxon style, was not the invention of our ancestors, but was imported from Italy in the seventh century: and it is equally evident, from various monuments, that the Italians in this and the subsequent ages built in the same heavy manner, and made use of the same members and ornaments, that the English Saxons did. Still the architecture of our ancestors, previously to the conquest, though very heavy and rude, has been too much depreciated by many English writers. The Rev. Mr. Bentham, in his "History of the Church of Ely," or rather the poet Gray, who drew up the architectural part of that work, refutes Somner, Staveley, and other authors, who deny that the Saxon builders made use of stone for their buildings, or knew how to turn an arch; but than this very writer fails to do them the justice due to them, where he signifies that they were unacquainted with the use of towers, bells, and transepts, previously to the tenth century. It would have been strange if they had not imported these amongst other ecclesiastical inventions from Italy during the preceding centuries; but we have otherwise sufficient proofs that they had adopted each of them long before the tenth century.

During a great part of the ninth and tenth centuries, England and France were as much harassed by invasions of the Northern barbarians, as their former inhabitants, the Gauls and Britons, had been in the fifth century, by the ancestors of the now civilized Saxons and French. These turbulent invaders, who were indifferently called Danes or Normans, were guilty of much greater devastation upon the existing religious monuments, at least, than the Goths and Vandals had committed; because the latter were Christians, though Arians, when they over-ran the civilized world; whereas the Danes and Normans, when they invaded England and France, were persecuting Pagans. So great was the dread of their violence throughout the last mentioned country, that the following petition was there added to the litany: "From the fury of the Normans, O Lord deliver us." In fact, the Almighty was pleased to deliver first France and then England, from the scourge which had so long and so forely afflicted them; but in a very different manner from what the Christian inhabitants expected. Instead of witnessing the extermination or subjugation of their barbarous enemies, they saw them bend their necks to the yoke of Christ, and become models of piety and morality to themselves and the other Christian nations. At least was the case with the Northern men, who settled in that part of France, which from them has since been called Normandy. A lasting peace and tranquillity being, through this happy event, restored to the French provinces, its princes and nobles began to rebuild their demolished churches, and to erect others with incredible diligence. But no people shewed so much zeal in this undertaking as the newly converted Normans. The reader will be convinced of this, when he is given to understand that William the Conqueror, during the few years that he reigned in Normandy, and finally to his invasion of England, built two noble churches and abbeys, and his nobles, not fewer than thirty-eight, each of them vying with the rest, to make his building the most magnificent and splendid. Such were the Normans, the bravest, most industrious, and most religious people, and the most addicted, in particular, to ecclesiastical architecture of all Christian people, when William, their prince, with the power of his nobles, his army, and his ecclesiastics, came to settle in England soon after the middle of the eleventh century. It is to be observed, that the most celebrated schools of

literature and the arts, and more particularly of architecture in Europe, at this period, were the abbeys of Bec and Caen in Normandy, the former of which produced those three great architects, Lanfranc and Anselm, successively archbishops of Canterbury, and Gundulph, bishop of Rochester. But indeed all the Norman prelates and abbots appear to have been able architects: for there was hardly a cathedral or abbey church in England which was not rebuilt by one or other of them, in the course of thirty or forty years after the conquest. The characters which they aimed at in these structures were evidently the sublime and beautiful. To produce the former effect, they built their churches as long and as lofty as possible; to produce the latter effect, they not only built in a much more neat and perfect manner than the Saxons had done, but also they made use of certain new invented ornaments in their structures. Of these the most ostensible and ordinary was the arcade or series of arches which, in one or other of its various forms, is to be met with in all the existing Norman churches. From the continued efforts of these indefatigable and ingenious architects, to make their churches as awful and as beautiful as possible, before the middle of the twelfth century, a new style of building was produced, called "the Pointed Style." It certainly appeared, for the first time, either in England or in France; nevertheless, the first ascertained instance of it which has hitherto been produced, claims the honour of the invention for this country. But before we proceed to give a more particular account of the rise and progress of this singular style of building, it will be proper to detail the various other systems which have been published respecting it.

It has been seen above, that Mr. Evelyn and sir Christopher Wren describe the architecture of the middle ages, in general, whether circular or pointed, under the opprobrious term of Gothic, as being the real invention of the Goths and other barbarians. The former of these writers, as quoted with applause by the latter, says, in his "Parentalia:" "The Goths and Vandals having demolished the Greek and Roman architecture, introduced, in its stead, a certain fantastical and licentious manner of building, which we have since called modern Gothic, of the greatest industry and expensive carving, full of fret and lamentable imagery, sparing neither pains nor cost." We see that the writer here speaks of the light pointed ornamental style of our ancestors no less clearly than he does in another passage, quoted above, of the plain heavy circular style, called the Saxon; and that he supposes the former no less than the latter to have been really introduced into the countries, which had formed the Roman empire, by the Goths and Vandals, who subdued them. How little reason there is for ascribing the Saxon style to these barbarians has been shewn above; and, with respect to the pointed style, it is sufficient to observe that this appeared in no part of Christendom before the twelfth century; whereas the Goths and Vandals committed whatever depredations on the monuments of Roman art, which they did commit, in the fifth century, and that their power was every where crushed, and their very name extinguished in the course of the sixth century, except, indeed, in Spain, where the name of Gothic remained attached to the reigning family, till the beginning of the eighth century and no longer. So groundless and absurd, in every respect, is the term Gothic, as applied to pointed architecture!

At the same time that sir Christopher commends the system of his friend Mr. Evelyn, he himself departs from it, since he prefers the word *Saracenic* to denote the pointed style. "What we now vulgarly call the Gothic," he says, "ought properly and truly to be named Saracenic architecture, refined by the Christians, which first of all began in the East, after the

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the fall of the Greek empire. The holy war gave the Christians who had been there an idea of the Saracen works, which were afterwards imitated by them in the West."

This system concerning the pointed style, namely, that it originated with the Saracens, has, out of mere respect to the name of its author, fr Christopher Wren, been followed by bishop Lowth, in his life of Wykeham, by Rions, by War-ton, by Grose, and, in short, by the generality of modern writers who have had occasion to enter upon the subject. In refutation, however, of this system, we have to remark that the first, or Grand Crusade, in which the conqueror's son, Robert, and many other Normans and Englishmen embarked, making part of above a million of persons, who were engaged in it, began in 1096, and terminated by the capture of Jerusalem in 1099. Now it is certain from history that the cathedrals of Exeter, Rochester, and Chichester, with many abbey churches, were built wholly in the circular style after the last-mentioned year. Amongst these the instance which is most to the present purpose is that of Rochester cathedral, which was built by that greatest architect of his age, Gundulph, formerly a monk of Bec abbey, then bishop of Rochester, as well as the castle of that city, the chapel in the white tower of London, &c. without the least mixture of the pointed style. The reason of this is, because Gundulph had travelled through the East on a pilgrimage to Jerusalem, a little before the crusade took place, when he had an opportunity of surveying the churches and other buildings of those countries at his leisure. Again, it has been remarked by Grose, Bentham, and other writers on the subject, that in all the descriptions and drawings of buildings in the Holy Land and other parts of the East, given us by Pocock, Norden, Shaw, Le Bruyn, &c. there is but one church, namely, that of St. John d'Acre, in the proper pointed style (which church the writer of this article has discovered to have been built by William, an Englishman, at the time when our Richard I. made himself master of that city); and that very rarely such a thing as a pointed arch is represented as existing in those countries. It is true a late writer, the Rev. Mr. Whittington, in his "Survey of the Ecclesiastical Antiquities of France," has proposed to discover from these and other drawings pointed architecture in every part of the East, from the Euxine sea to Egypt; but then it appears that he calls the mis-shapen obelisks and minarets of the Mahomedan mosques pointed architecture. He has another argument for his assertion, namely, that "it is improbable the dark ages of the West should have given a model of architecture to the East." If there is any force in this argument, it would follow that the musical scale of bells, optical glasses, the mariner's compass, gun-powder, and printing were discovered in the East instead of the West, contrary to the known fact.

Mr. Murphy, to whom the admirers of pointed architecture are indebted for his elegant views of the church of Batalha in Portugal, conjectures that this style was borrowed from the pyramids, and that of course Egypt was its native soil. But in almost every country and age men have built their habitations with sloping roofs to carry off the falling rain; hence they must have seen the figure of a triangle at the gable ends of them, no less than the Egyptians did in their pyramids. Denon's, Meyer's, and other views of ancient buildings in Egypt, are by no means favourable to Mr. Murphy's system. There is indeed an ancient hall in the call of Cairo, called Joseph's Hall, which is a great deal in the pointed manner, and which is supposed by the vulgar to have been built by the patriarch of that name; but Niebuhr and lord Valentia give sufficient reason to believe that it was

built by Saladin, the enemy of our Richard I, whose name was Joseph. In fact, it is in the style of that period. According to this supposition, we are warranted in believing that this hall was the workmanship of Christian prisoners, or fugitives, after the third crusade. Mr. Murphy's theory is equally destitute of historical grounds and moral probability.

Bishop Warburton, in his "Notes on Pope's Epistles," endeavours to unite together two of the above-mentioned refuted systems, that which derives pointed architecture from the Northern Goths, and that which brings it from the Eastern Saracens, at the same time that he assigns the western peninsula of Europe for the real place of its birth. The following is an abridgment of his account: "When the Goths had conquered Spain, and the religion of the old (Christian) inhabitants had inflamed their party, they struck out a new species of architecture unknown to Greece or Rome. For this northern people having been accustom'd, during the gloom of Paganism, to worship the Deity in groves, when their new religion required covered edifices, they ingeniously projected to make them resemble groves; at once indulging their old prejudices, and providing for their present conveniences by a cool receptacle in a sultry climate, with the assistance of Saracen architects, whose exotic style of building suited their purpose." All this is a mere story. The Goths and Vandals entered Spain in the year 409. They did not, however, acquire there a new religion from the old inhabitants, for they were already Christians, and habituated to the use of churches. On the other hand, the Moors or Saracens did not enter Spain till three hundred years afterwards, namely, till the year 712, when having crossed up the Christians in the mountains of Astura, there continued ever afterwards the most relentless warfare between the two people. It is impossible to conceive more monstrous ideas than that the Christian Goths should have brought with them into Spain a partiality for the Pagan worship which they had practised in the forests of Germany, and that they should have retained it for the space of three hundred years afterwards, till they had the means of employing their implacable enemies, the Mahomedan Moors, to build Christian churches for their use; and that when this was effected, they should have kept the secret of pointed architecture to themselves for the space of 400 years longer! Were all this possible, or were it a fact that this style had been imported into our country from any other, where it had been practised for a considerable time before, it would have made its appearance amongst us all at once, with its several striking characters, contrary to what we actually see was the fact. After all, the style of an ancient cathedral resembles in many of its parts in some respects, it differs from it in many others, which are obvious to the sight.

Having followed different guides, north, east, and west, in search of the original pointed architecture, we have lately been invited by an ingenious artist to accompany him to the south, namely, into Italy, the cradle of modern arts, with a promise that he will there point out to us some earlier specimens of this style than are to be met with in this northern climate. In the year 1785 Mr. Smeaton then returned from Italy, and had in the possession of Mr. Goussier a certain drawing, since engraved in the "L'architecte" vol. xv, of the designs of this style than are to be met with in the cathedral of Messina, in the north style of architecture, pointed order, being such as we have no example of in this country before the middle of the reign of Henry II. The drawings he would have us believe are copied from the cathedral of Salerno, which was built by the Norman king Robert, or earl of Sicily,

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ly, in the eleventh century. He presented another drawing, published by the society as aforesaid, which appeared to be much more for his purpose, because of the known dates of the original. This drawing represents a portion of the outside of the baptistery of the cathedral church at Pisa, which baptistery was certainly built by Diotti Salvi in 1152. The drawing exhibits what we should call Roman and Saxon work, with intermixed crocketed pediments and pinnacles, such as we were unacquainted with for more than a hundred years afterwards. Lastly, this gentleman shewed a view of the cloister of Campo Santo, adjoining the last mentioned cathedral, built in 1278. Here we see the richest tracery mullions under semi-circular arches, the whole of which he considered as being the same original work. These specimens gained many converts to his system, that of Italy being the parent country of pointed architecture.

But there is no error which we have so much to guard against in studying architectural antiquity as the confounding of subsequent alterations with the original work. There are few adepts in this science who would not start at the first sight of Mr. Smirke's drawings, and who would not pronounce the works they represent as an incongruous mixture of the architecture of different ages; but it was reserved for sir Henry Englefield's profound knowledge of the subject and critical acumen to detect and exhibit in detail the pointed enrichments with which later architects had decorated the plain circular works of their predecessors. To the justice of this learned antiquary's remarks the accurate history of the cathedral of Pisa, written by Martini a canon of that church, bears ample testimony. In a word, the very specimens which Mr. Smirke has produced in favour of Italy's claim to the invention of pointed architecture, as well as all the other buildings, tombs, and altars at Rome, and in every other part of Italy, demonstrate its great inferiority both in date and in execution, to England, France, and Germany, with respect to this particular style.

Allied, in one respect to the system of bishop Warburton, is that of sir James Hall, bart, who, in "An Essay on Gothic Architecture," now published, endeavours to shew that the pointed style was borrowed from the idea of upright posts surrounded with others, the heads of which are to meet like those of trees in an avenue. But the utmost that the ingenious baronet proves is that basket-work may be made to resemble pointed architecture, not that pointed architecture was borrowed from existing models of basket-work. Lord Orford, heretofore sir Horace Walpole, in his "Observations on English Architecture," says, that the architecture in question was copied from shrine-work; just as if the making of boxes preceded the building of houses! After all, this is only placing the tortoise under the elephant; for where did artists learn to fashion their shrines in the pointed style! Lastly, Mr. Payne Knight derives this style from all the three parts of the world, heretofore known, Europe, Asia and Africa, where he decides, in his "Principles of Taste," that "the style of architecture which we call cathedral or monastic, is manifestly a corruption of the sacred architecture of the Greeks or Romans, by a mixture of the Moorish or Saracenic, which is formed out of a combination of the Egyptian, Persian, and Hindoo."

But why should we wander into every remote corner of the world, and even into the regions of fancy in search of an invention which belongs to our own climate? And for what purpose should we take so much pains to prove a plant to be an imported exotic which we have seen sprouting up, and attaining its full growth in our own garden? Let us now go back to the point from which we started in pursuit of va-

rious false systems. We have seen above that the greatest people, without dispute, of the eleventh and twelfth centuries, namely, the Normans, the conquerors of England, France, Italy, Sicily, and various regions in the East, were at the same time a most industrious and ingenious people, and possessed of the most ardent passion for ecclesiastical architecture of any people we read of, and that they vied with each other in the grandeur and beauty of their respective structures. To produce the effect of grandeur, as it has been before observed, they gave the greatest possible length and height to their churches; for that of beauty they devised several architectural ornaments; the most common of which was the arcade or series of small round arches, which appear on some part or other of all their churches built in this country subsequent to their conquest of it, and which sometimes cover the whole of them over; as we see on the outside of St. Botolph's priory, and St. Olyth's abbey in Essex, and in the basement story of the inside of Durham cathedral. These arcades the architects diversified in a great variety of ways, as may be seen upon the tower of St. Augustine's monastery in Canterbury, built by the Norman abbot Scoltandus in 1080. One of the varieties consisted in making the circular arches intersect each other. The portion thus intersected formed a new kind of arch, more graceful in its appearance, and far better calculated to give an idea of height than the round one, which, however, had hitherto been adopted by all nations; whether Egyptians, Greeks, Romans, or Saxons. In fact, every one must be sensible that a pyramid or obelisk, from its aspiring form, appears to be taller than a semi-circular arch, the diameter of which is equal in height to it. These plain and intersecting arcades were sometimes irregularly intermixed, as in Carilepho's and Flambard's work on the north side of Durham cathedral; and sometimes placed in alternate rows, as in that of Remigius on the façade of his church at Lincoln. The pointed arch thus formed appeared first in mere *basso relievo*, as in the above mentioned instances, amongst several others; but soon it was likewise seen in *alto relievo* over niches and recesses, in the walls of churches, as in the remains of archbishop Lanfranc's work in Canterbury cathedral, and in the abbey churches of Glastonbury and Rumsy. It is probable that some of the first, if not quite the first open arches in the pointed style now existing, are the twenty windows in the intersected portions of such crossing arches in the choir of St. Cross near Winchester, made by that great encourager of the arts, and particularly of architecture, bishop Henry de Blois, king Stephen's brother. The date of this work is 1132, according to Godwin, Grose, and others, or else 1130, according to bishop Lowth, who had examined the records of this foundation, and Rudborne, the monk of Winchester, in his "Historia Major Wintoniensis." Most probably the choir was begun in the former year, and finished in the latter. As the prelate proceeded in his work, from the choir to the transept and tower of his church, he made several other pointed arches without any intersecting circles over them, notwithstanding the greater part of his work, as still appears, was the circular Saxon. In 1138, as we are assured by the above-mentioned monk of Winchester, and another monk who wrote the "Annales Wintoniensis," bishop De Blois rebuilt his episcopal mansion of Farnham in Surrey, where his successors still ordinarily reside. Now in the ancient part of this building, we see at the present day pointed arches resting upon circular Saxon columns, just as we do at St. Cross; and no architectural critic, with these documents before him, will hesi-



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tate a moment in pronouncing them part of the work in question, executed by De Blois in 1138. As the same prelate restored the abbatical church at Ruffey, where his niece Mary was a nun, and as he himself had been abbot of Glastonbury, before he was bishop of Winchester, we may safely attribute the pointed arches, intermixed with the circular ones in these two structures, to his direction, some time in the latter end of the reign of his cousin Henry I.

After all, it would be rash to pronounce absolutely that bishop De Blois of Winchester was the author of pointed architecture, since we have convincing evidence, that churches were built by other architects about this period, in the same mixed style of pointed and circular work. We must, however, incidentally observe, that before the conclusion of this twelfth century, the circular style was entirely laid aside, as well with respect to columns as to arches. We have evidence, for example, in the annals both of St. Wurburg's abbey Chester, and of Peterborough abbey, quoted by Dugdale, that Bildwas abbey in Shropshire, where the seven pointed arches of the nave, surmounted by small circular arches, in the upper story, are still seen, was founded either in 1136 or 1139; probably it was begun in the former year, and finished in the latter. We might argue in the same manner from the dates and actual state of Kirkstall abbey, Lantony abbey, and several other ancient structures. If we may give implicit credit to the testimony and the plates of captain Grose, the Scotch architects were not long in adopting the style of their English neighbours. It is remarkable that the ecclesiastical buildings erected by David king of Scotland, and his nobles, before he came into England in order to command the armies of his niece, the empress Maud, were purely in the Saxon style; whereas those founded there, after that event, present the same mixture of circular and pointed architecture which prevailed at that period in England.

A late writer, the Rev. Mr. Whittington, whose professed object it was to transfer the credit of the discovery in question from the Norman English and English to the French, which credit the latter seem disposed, from traditional accounts, to attribute to our countrymen, has asserted that examples of pointed arches, of a more ancient date than any existing in England, are to be met with at the abbey church of St. Denis near Paris, which church was finished in 1144. It appears, however, that this writer was unacquainted with the historical evidence on which the above-mentioned early instances of the pointed arch in England rest, and that he was even at a loss to determine which of the works at St. Denis really belonged to the period he has assigned. If we examine the pointed windows of this abbey, exhibiting different transactions of the first crusade in Montfaucon's "Monarchie Françoise," which windows are said by this great antiquary to have been executed by abbot Suger in 1140, we shall not find the appearance of a pointed arch in any one of them. It may be added, that in the famous tapestry of Bayeux, representing the conquest of England, and said to have been wrought by the conqueror's mother, there is no appearance either of a pointed, or so much as of an intersected arch, in the several churches, shrines, and other architectural works there displayed. In a word, throughout the whole of Montfaucon's plates, we every where find the French pointed architecture much inferior to that of a corresponding date in our own country.

To return to the subject of intersecting arches: we observe these sometimes to consist of plain semicircles crossing each other, as on the outside of the fourth transept of Wal-

kelyn's work at Winchester, and on the north transept of Warlewast's work at Exeter, forming in the latter a simple pointed arches; and sometimes we remark that the intersections rest upon pillars, each of them being surmounted with a capital, or at least with an abacus, as on the north transept of Durham, and the west front of Ely cathedrals. In the latter case, we have the appearance of pointed arches with lateral points, or cusps, which is not of them, as Sir James Hall has very aptly observed. This addition to the pointed arch was occasioned by the first period or order of pointed architecture, when it became universal. The addition of another to the outside of the pointed arch, turned its triangular point into a foil. In like manner, four of these cusps, placed at equal distances within that circle or "L'Œil de Bœuf," which the Roman and Saxon architects had been in the habit of placing in the tympanum of their pediments, changed it into an elegant quatrefoil or cross. By means of additional cusps, and circles with a circle, the Gothic wheel, or Marygold window, as it is called in English, or "La Rose du Portail," as the French term it, was first produced. In all the works executed during the middle and latter part of the twelfth century, a continued and heterogeneous mixture of styles is every where discernible, and might be expected where circular fashion began to be let out, and the pointed one to be used instead of it.

In a general way, the arches were altered before the columns. Hence nothing is so common as to find in the structures erected between 1140 and 1180, arches of the sharpest points, resting on circular Saxon pillars of the greatest circumference. It could not, however, long escape the observation of our indefatigable architects, that such heavy supporters ill accorded with the lightness of the aspiring arch. Accordingly, towards the latter end of this twelfth century, in some instances the circular Saxon column began to be shaped like the Arabic numerical figure 8, so as to retain its former strength, and to appear gracefully slender; and where columns were made use of more for decoration than for strength, as for example to support ornamental arcades, or the cornices of windows or doors, very thin detached columns were employed, and those for the most part made of Parbeck or Petworth marble. We have a striking and most interesting example of these and other improvements which took place in the pointed style, towards the latter part of the twelfth century, in the east end of Canterbury cathedral. Persons who cannot see the original, will find it accurately represented in Mr. Carter's treasury of original specimens, called "The Ancient Architecture of England." This portion of our Metropolitan church was retained, after an accidental fire had destroyed the upper part, and weakened the remainder of it, between the years 1175 and 1180. As we have the incomparable advantage of possessing a circumstantial account of this building, and of the differences between it and the former structure, raised a hundred years before, by archbishop Lanfranc, which account is drawn up by the intelligent monk Gervase of Canterbury, who was an eye-witness of what he relates, we shall subscribe to the most material parts of it; he tells us that the pillars of the new choir were of the same form and thickness with those of the old choir, but that they were twelve feet longer; that the former capitals were plain, while the latter were delicately carved; that there were no marble columns in Lanfranc's work, but that there was an incredible number of them in the work of the archbishop Williams; that the stones which formed the ancient arches were cut with an axe, but those of new arches with

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a chancel; that the vaulting of the side aisles of the choir was plain, whilst that of the new choir was groined and fixed with key-stones; that the former choir had a flat ceiling ornamentally pointed; but that the succeeding choir was elegantly vaulted with hard stone for its ribs, and light tuff stone for the interlicies; finally, that there was only one triforium, or gallery, round the ancient choir, whilst there were two such in the modern choir. The east end of this venerable cathedral, as it is seen at the present day, and as it is represented by Mr. Carter, exactly corresponds in these and in other particulars with this description of it, given 600 years ago. It is all in the first order of the pointed style, except the main pillars, which are (to the eye) round, with a sort of Corinthian capital, and except the arches springing from these pillars, which are also circular as far as the *concha absidis* or altar end, these being pointed, as likewise with the exception of certain blockings and mouldings, where the Saxon billet ornament is still seen.

The improved architecture of this, the most dignified church in the island, could not fail of being adopted in our other churches, when there was occasion for rebuilding or repairing them. Lincoln cathedral seems to have led the way in this particular about the year 1195, under the direction of its bishop St. Hugh, who was not less renowned for his skill in architecture than for the sanctity of his life. This prelate undertook to rebuild the whole of his vast cathedral, and he was so intent upon the work, that, as Matthew Paris tells us, he carried mortar and stones on his own shoulders for the use of the masons. The building was so far advanced at the time of his death, which happened in the year 1200, that he is considered and called its founder, though his work was not finished till about fifty years afterwards, in the episcopacy of Robert Grossetete. Excepting the west front, which is almost all the work of the Norman prelate Remigius, and the towers, the groining, the screens, and certain other decorations added in the fourteenth century, the whole vast pile of St. Mary's church and Chapter-house at Lincoln is in the simple style of the first or lancet order of pointed architecture; but awful and beautiful beyond the conception of those who have not seen it, and greatly superior to any church of the same order and period to be found in France. In 1202, the rich and powerful bishop Godfrey de Lucy, amongst his other great works, began to rebuild the eastern part of his cathedral at Winchester, which he executed in the style of the Metropolitan choir, but without the least mixture of the Saxon. His extensive work is still to be seen there, consisting of long narrow sharp-pointed windows and other arches, detached pillars of Purbec marble, quatre-foil mouldings, and light groining of simple intersecting ribs. And, whereas, it became very usual, for the sake of gracefulness and also of use, where they were used as windows, to place two of these narrow arches close together under another pointed arch of greater width, in consequence of which a vacant space occurred between their heads; a trefoil, quatrefoil, or cinquefoil was frequently introduced, with the happiest effect, to fill up this space. In 1227 archbishop Walter de Grey began to rebuild the northern Metropolitan church of York in the prevailing style, and he actually finished the fourth cross aisle as it is now seen. The same kind of work was going on at this time at Worcester, Salisbury, and other cathedral and abbey churches. The last-mentioned church, which was an entire new foundation, begun by bishop De Poore in 1220, and finished by bishop Bridport in 1258, exhibits, in its front and other parts, the double lancet arch, with the intermediate quatre-foil rose, and all the other cha-

acters described above. There being occasion, however, to place three lancet arches together in the windows of the upper story, the head of the middle one was gracefully raised above the other two, an improvement which was soon adopted in many other churches. A still more striking improvement which took place, if not at Salisbury for the first time, at least about the time of its completion, was the elevation of the cornice, pediment, or canopy which had hitherto adhered, or at least had been very near to the architrave of the arch. This was now raised, like the two sides of a triangle, to a considerable height above it. The jambs of the pediment were at first rather short, not reaching, by any means, so low as the springing of the arch, and generally resting on some small flower or other slight ornament. The point of the canopy always terminated in a trefoil or other graceful ornament, but was not, as yet, adorned with crockets or foliage down the jambs. Bishop De Poore, being translated to Durham, began to ornament the east end of his present cathedral in the style which he had introduced into the one he had left. Whilst the work at Salisbury was drawing towards a conclusion, that at Westminster abbey was beginning, namely, in the year 1245. The north transept, and part of the adjoining nave of the church, remain in almost the same state they were left in by their founder Henry III. The windows of the last-mentioned portion of the abbey, together with the corresponding aisle, are larger and better proportioned than any which had hitherto been seen in this island. Here also we meet with the cinquefoil rose between the heads of the two lights; while the exterior windows of the triforium or gallery consist entirely of a triple cinquefoil under a pointed arch. These two models for the upper part of church windows were long followed. On the other hand, the arches and windows of the transept, being placed in a regular order, and very near to each other, presented an appearance of those large mullioned windows which, in the succeeding period of this style, came into fashion. In this part also of the abbey church, namely, the inside of the transept, we begin to meet with good statuary.

During the reign of Henry's son, Edward I., which began in 1272, the architecture of this country, through the ingenuity and industry of its artists, acquired a new character, and may be said to have grown into a new order of the pointed style. The first and distinguishing feature of this was the general adoption of the well proportioned and well turned aspiring arch. The arches which had hitherto been constructed, though sometimes accidentally perfect, were, for the most part, too acute. But the arches built at the latter end of the thirteenth century generally approached to the perfect proportion. This proportion, according to the best judges, is when an equilateral triangle can be inscribed within the crown and impost of the arch. The arches also were gracefully turned. Besides all this, they were now invariably ornamented in their heads with cusps, so as to form trefoils, cinquefoils, or septfoils. In like manner the pediments or canopies over the arches were universally purled, that is to say, adorned with the representation of foliage called crockets, from the corbel on which they rested up to the rich flower or other elaborate finial in which they terminated. These corbels or brackets now corresponded in height with the springing of the arch, and mostly exhibited busts of the founders or other benefactors of the establishment. Pinnacles, which hitherto had been both very simple and very rare, were, in this improved order, placed at the sides of almost every arch, and on the top of almost every buttress, being invariably purled and furnished with rich finials. A pinnacle of a proportionable

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size being placed on a tower, instead of a buttress, became a broach or spire. Accordingly the use of spires became almost general in the fourteenth century. We even read of a new built tower being pulled down, because it was unequal to bear the weight of this grand ornament, when a new one was built, which, with its spire, was as high as the church was long. In the same spirit of ornamental grandeur, the buttresses, supporting the upper part of the nave, instead of being concealed in the roofs of the side aisles, were brought into view with suitable decorations, and made to stretch over the tops of those aisles, in what are called flying buttresses. The window no longer consisted of an arch divided by a simple mullion, and surmounted by a single or a triple rose, but was henceforward, in all grand churches, portioned out by mullions into three, four, five, six, and sometimes into nine different bays or days, as the separate lights in a window were then called; and these again were frequently subdivided by one or more transoms running across them. Their heads also were varied by tracery work into a variety of architectural designs, and sometimes, as at the west end of York, into the form of a beautiful flower. The plain niches of the thirteenth century became, in the fourteenth, gorgeous tabernacles, in which as much architectural skill was often displayed as in the whole church to which they belonged. These tabernacles, as well as various other parts of the sacred edifice, were filled with statues, which frequently shewed equal spirit in the design and art in the execution. Finally, the ribs supporting the groined ceiling were no longer simple intersecting arches; but they branched out into tracery work, still richer and more elegant than that in the grand windows of this period; and wherever the ribs met, they were tied together by an architectural knot or boss, which generally exhibited some instructive device. It must not be forgotten, that during the latter part of this period, the pediments which before had been straight, began to humour the sweep of the arch, by which means they became less high and more graceful.

We have instances of these improvements, or rather of this new order of the pointed style, in the three remaining architectural crosses, erected by Edward I. those of Northampton, Geddington, and Waltham; to the memory of his queen Eleanor, who died in 1290; likewise in the magnificent tomb of his brother Edmund Crouchback in Westminster abbey, who departed this life in 1296. But the most complete specimen of the whole detail of these improvements is York Minster, the nave of which, as it stands, was built between the years 1290 and 1330, and the choir some thirty years after the latter period. If any similar structure in the same style, but upon a smaller scale, could, in its time, have vied with this in beauty and grandeur, it was St. Stephen's chapel, Westminster, now the house of commons, which Edward III. began to erect in 1348. Of the inimitable beauties of the latter erection, only a few scattered vestiges remain, to shew the architectural antiquary what it was in its glory. There are few, if any, of our cathedrals and remaining abbey churches which were not rebuilt or restored in some considerable part or other of them, according to this improved order. Before 1321, bishop Langton had added the Lady chapel to his cathedral of Litchfield, had groined the nave and choir, and had erected the magnificent western façade. About the same time the greater part of the nave of Westminster abbey church was rebuilt. Between the years 1327 and 1340, Exeter cathedral was groined, and its heavy Norman arches and pillars were changed into light and graceful pointed arches and clustered columns, by its munificent prelate Grandison. During the

pontificate of archbishop Courtenay, which began in 1351, and that of his successor Arundel, the nave of Canterbury cathedral was rebuilt. During the same period that eminent prelate and architect, William of Wykeham, was employed in performing the same difficult transmutation of the nave of Winchester cathedral, which had been performed in that of Exeter. The circular columns and arches were not taken down, as has been generally supposed, but the former were ceased and the latter reduced to a point. This may be ascertained by an attentive examination of the work within the roofs of these structures; and without this trouble, by simply looking at the nave of Gloucester, St. Albans, or Ruffey great church, where the operation here described will appear to have been performed, on two or three of the circular pillars and arches at the west end, and to have been left off with respect to the other pillars and arches. The taste for these improvements descended even to country parish churches, few of which did not either or both exchange their ancient windows, at least, for those of the pointed style.

But human arts, like the human body, when they have attained to the perfection of their state, tend towards their decline. This was the case with that singular invention, pointed architecture. Its rise, progress, and decline, occupy little more in the chronology of the world than four centuries. As its characteristic perfection consisted in the due elevation of the arch, so its decline commenced by an undue depression of it. This new style, or third order of pointed architecture, took place in the latter part of the fifteenth century, and is to be seen in the royal chapels of St. George, Windsor, of King's college, Cambridge, and of Henry VII., Westminster. It cannot be denied, that the builders of these splendid and justly admired structures displayed more art and more professional science than even their predecessors had done; but then they displayed this at the expence of the style itself, which they cultivated, and of the awful and devout impressions which this style was invented to excite. The spectator was now amazed to see huge masses of stone, called pendent capitals, each one of more than a ton weight, hanging in the air, which, instead of supporting the vault groins they were fixed in, were supported by them; the consequence of this, however, was to bring the flat arches of the ceiling still nearer to the eye, so that their curvature was henceforward discernible at their springing rather than at their point. Finally, ingenuity was at this period much more affected than awfulness: hence those royal chapels, and several mortuary ones built in Winchester, Peterborough, and our other grand churches, during the time of the two last Henries, are seen covered over with tracery, and loaded in their groins and friezes with busts, armorial bearings, and rebuses, beyond all due proportion, so that, however elegant the design, and exquisite the execution of them generally is, a judicious spectator, after admiring them, fails not to prefer to them the chaste grandeur of York Minster, or even the unadorned majesty of Salisbury cathedral. The church-windows of this period were so multiplied and enlarged, as to become what a late writer, Mr. Whittington, professes to admire "all window," but which they certainly could not become without great detriment to the character of awfulness in the church itself. The same depression of the pointed arch took place on the outside as in the inside of the buildings of this period. Instead of the tapering pinnacles and lofty turrets which had hitherto adorned the towers of churches, these structures were now generally covered with round cupolas, and the portals, instead of being surmounted with crocketed pediments and graceful pinnacles,

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were generally enclosed within square architraves, the chief ornaments of which were seen in the spandrels. All this, however, is to be understood with some exceptions. For example, bishop Oliver King erected his church at Bath, about the year 1500, in a very simple fashion of pointed architecture, and bishop Fox repaired the presbytery and chancel of Winchester cathedral with a chaste and tasteful elegance.

But the downfall of pointed architecture in this kingdom became inevitable from various causes, chiefly, however, from the loss of its characters of majesty and awfulness, the necessary consequence of the depression of its sublime and graceful arch. The destruction of it was complete at the beginning of the reign of Edward VI., from which period, till the introduction of the pure Grecian style in the reign of Charles I., a real Gothic, or at least a truly barbaric style took place, consisting of a confused medley of all the known styles and orders of styles, intermixed with globes, triangles, pyramids, obelisks, frets, and other whimsical and ugly devices, as may still be seen in the sepulchral and other monuments of the period in question.

From what has been said, it appears that the term *Gothic* architecture is an improper one, as applied to any species of architecture whatsoever; that the mode of building which prevailed amongst our ancestors before the conquest, called the Saxon style, consisting of round pillars with rude capitals and bases, and of circular arches, was strictly Roman, being copied, even to its minute ornaments, from coeval originals at Rome, and having been first taught and practised in this island by Roman masons; that this style was succeeded, before the middle of the twelfth century, by a style of architecture perfectly new, the essential character of which is the pointed arch, from which, by a natural process, the slender cluster column, the aspiring cornice or pediment, the crocketed pinnacle and lofty spire, with the other ornaments mentioned above, actually grew; that this style was not borrowed from Northern Goths, nor Eastern Saracens, nor Western Moors, nor Southern Italians (for in this style the Italians themselves were but novices, and not very apt ones), but that it was discovered in this climate, most probably by the English Normans, the greatest people of the 12th age, and the fonsicil of ecclesiastical architecture that ever existed; that the style was improved by the joint efforts of the Normans, English, and French, at a time when our kings were masters of the fairest provinces of France, and brought to its perfection, chiefly by the ingenuity and industry of the English, during a period in which England was in prosperity by her conquests, and France in desolation from her defeats; that there are three distinct orders in this style, the members and proportions of which can be distinctly pointed out by professional men, (such as the author of the "Ancient Architecture of England") with almost as much accuracy as those of the five Grecian orders; on which subject it may be observed, that these Grecian orders were practised long before their members and proportions were accurately laid down, that the characteristic of the first order is the acute arch, and that the period of its duration may, in a general way, be said to have lasted from the middle of the twelfth to the end of the thirteenth century: of this order, Lincoln, Beverley, and Salisbury churches are examples; that the chief characteristic of the second order, is the perfect or equilateral arch, the reign of which was from the end of the thirteenth, till about the middle of the fifteenth century, to which order York Minster, and the naves of Winchester and Canterbury cathedrals belong; and that finally, the characteristic of the third order is the obtuse

arch, which grew into fashion about the last-mentioned period, and lasted to the downfall of pointed architecture itself in the middle of the sixteenth century. The finest specimens of this, doubtless, are the above-mentioned royal chapel. With respect to the proper denomination of this style, some of the learned, as well as the vulgar in general, still call it the Gothic, others the Saracenic, a third class, the Norman, a fourth, the English, and a fifth, the pointed. From the whole of what has been said above, it will be readily concluded, that the present writer conceives the last of these terms to be the best adapted to the style, as being the most strictly descriptive of its characteristic quality.

This article is the abridgment of a much longer treatise on pointed architecture, which is shortly expected to appear from the press of Mr. Taylor's Architectural Library; in which treatise many historical documents in support of the present system, and certain plates to illustrate it, will be seen. M.

*Gothic Bible.* See BIBLE, and ARGENTUS *Codex*.

*Gothic Character, or Writing,* is a character or manner of writing, which, in the main, is the same with the Roman, only that it is very full of angles, turns, and bendings, especially at the beginning and ending of each letter.

The manuscripts in Gothic characters are not very ancient. Ulphilas, bishop of the Goths, was the first inventor of the Gothic characters, or the first who composed the Gothic alphabet, in imitation of the Greek, and the first that translated the bible into the Gothic tongue.

The letters used in the Gothic gospels are twenty-five in number, and formed, with slight variations, from the capitals of the Greek and Latin alphabet.

As these characters, in which the *Codex ARGENTUS*, or Gothic version of the bible, was written by Ulphilas, their inventor, were derived partly from the Greek and partly from the Latin, Michaelis (Introd. to the N. T.) thinks it natural to ascribe the said version not to the Franks or Germans, but to the Goths, who lived on the borders of the Danube; or in Wallachia, where they at that time resided, the Latin was spoken, and their nearest neighbours were the Greeks. A mixed alphabet, such as that which is found in the *Codex Argenteus*, is such as might reasonably be expected. Some of the words in this version are still used in the Lesser Tartary, the ancient seat of the Goths; e. g. *swilan*, "to die," from *swalt*, "death," a word that is quoted by Butbeck, from the language of the Crim Tartars. In this version, many words are adopted immediately from the Greek; *πατήρ*, *ata*, father; *ἀμω*, *awo*, the shoulder, where even the *s* is retained from the Greek termination, &c. Hence it is inferred, that the dialect, in which such words occur, was that of a nation that lived in the neighbourhood of the Greeks. This version has also Slavonian words, such as *fan*, a master, which prove it to have been written in the dialect of a nation that bordered on Sarmatia. The same may be said of many Latin words: such as *anacumbjan*, accumbere, to sit at table, *militondans*, militantes, foldiers, *ogha*, water, &c. This argument is the more decisive, when we consider, that the Goths, in the time of Ulphilas (see his biographical article,) lived in Wallachia, a country in which Roman colonies had been planted, and where a corrupt Latin is spoken at this very day. Ulphilas himself lived in Wallachia, and had it in his power at least to make use of Latin letters, as well as those of the Greeks, with whom he had continual intercourse. See *GOTHIC Language*.

The Runic characters are also frequently called Gothic characters. See Mabillon, *De Re Diplom.* lib. i. cap. 2.

But

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But they who take the Gothic characters to be the same with the Runic, are mistaken; as is shewn by Ol. Wormius, Junius in his preface to the Gospels written in Gothic letters, and Dr. Hicks on the Runic Tongue.

GOTHIC *Column* is any round pillar in a Gothic building, either too thick or too small for its height.

There are some found even twenty diameter high, without either diminution or swelling.

GOTHIC *Language*, the language of the Goths. This language, as the acknowledged parent of the English, is of considerable importance; while its remote antiquity, the scantiness of its records, and the circumstance of its having been studied only by few among the learned, have rendered it a matter of great uncertainty as to its character and origin. The questions respecting its antiquity and genius are referable into those in regard to the people who used it. Monf. Mallet, in his "Northern Antiquities," supposes that the ancient Gauls and Germans, the Britons and the Saxons, were all originally one and the same people: and thus he makes the Gothic the same with the Celtic tongue. This opinion, which was first taken up by Cluverius in his "German Antiquities," has been since adopted by Keyser in his "Northern and Celtic Antiquities," and Pelloutier in his "History of the Celts," and maintained by them with uncommon erudition. According to these writers, the ancient and original inhabitants of Europe consisted only of two distinct races of men, *viz.* the Celts and Sarmatians; and from one or other of these, but chiefly from the former, all the ancient nations of Europe are descended. The Sarmatians, or Sauromate, were the ancestors of all the Slavonian tribes, *viz.* the Poles, Russians, Bohemians, Wallachians, &c. who continue to this day a distinct and separate people, extremely different in their character, manners, laws, and language from the other race, which was that of the Celts; from whom, as they suppose, were descended the old inhabitants of Gaul, Germany, Scandinavia, Britain, and Spain, who were all included by the ancients under the general name of Hyperboreans, Scythians, and Celts, being all originally of one race and nation, and having all the same common language, religion, laws, customs, and manners.

This opinion, though supported with an uncommon display of deep erudition and a great variety of specious arguments, is controverted by the late learned and ingenious Dr. Percy, in a preface to Monf. Mallet's Northern Antiquities, which he has translated and enriched with notes. This profound antiquarian, in opposition to the French writers, states that ancient Germany, Scandinavia, Gaul, and Britain, were not inhabited by the descendants of one single race; but, on the contrary, divided between two very different people; the one of whom he calls with most of the Roman authors Celtic, who were the ancestors of the Gauls, Britons, and Irish; the other Gothic or Teutonic, from whom the Germans, Belgians, Saxons, and Scandinavians derived their origin; and that these were *ab origine* two distinct people, very unlike in their manners, customs, religion, and laws.

The Gothic, then, is radically different from the Celtic according to Dr. Percy, who, on the authority of Hicks, as stated in the preface to his "Institutiones Grammaticæ Anglo-Saxonicæ," gives the following genealogy of the two languages. Gothic is the parent of 1. Old Saxon, or Anglo-Saxon; 2. Francic or Franco-Theotifc; 3. Cimbric, or Old Icelandic. From the first, *viz.* the Anglo-Saxon, are again derived English, Broad Scotch, Belgic, or Low Dutch, and Frisic. From the Francic, are derived German, or High Dutch, German of Swabia, and Swiss; while the Cimbric, in

its turn, gave birth to the Icelandic, Norwegian or Norfick, Danish, and Swedish. On the other hand, the Celtic is represented by the same writer as the parent of the ancient Gaulish, the ancient British, (ramified into the Cornish, Armorican, or Bas-Bretagne, and Welsh,) and the ancient Irish, which was subdivided into Munck, or language of the Great Man, into Erse, or Highland Scotch, and Irish. To the old original mother tongue of all the Gothic dialects, it has been usual to give the name of Teutonic, not for such, as Dr. Percy asserts from its being the language of Tuisto, the great father and deity of the German tribes, and from the Teutones, the people who used it: the name probably with the Cimbric, or as the Greeks called them Κελτοί, who inhabited the northern regions, and more particularly the Danish islands. Now, in opposition to this writer, we are free to affirm, there is no ground for believing that this mother tongue, whether called Gothic or Teutonic, was in its primordial form different from the Celtic. And this proposition we shall endeavour to make manifest from the very specimens by which Dr. Percy has attempted to shew their essential difference. But before we enter on this question, it is necessary to remark, that learned men, in their enquiries concerning the origin of nations, have not sufficiently attended to the consideration which we learn from the Mosaic history, that all nations originated in a common family, and at first spoke a common language. Let us suppose that some members or descendants of this family, (as we read of Gomer,) emigrated from Asia to Europe. If they settled in Greece, they introduced with them the primordial customs, and language, though somewhat corrupted no doubt from its original purity. Others, actuated by the same spirit of emigration, would soon follow; and, if more powerful, would dislodge their predecessors, who had no other resource but to seek new habitations in remoter regions.

As these wanderers multiplied, they advanced, till, in the course of years, all the countries on the north and west, as well as on the east of Europe, were completely peopled. But this population of course could not take place before they had been divided into independent tribes, and distinguished by correspondent difference in dialects and manners. But still a very great resemblance must have as yet been visible among them in both these respects, however separated from each other: for in the earlier periods of society, language, though widely used, must long have continued the same, with little variations, it being corrupted and diversified into distinct tongues only by the progress of civilization, by the refinements of literature, by improvements in art and in government, and by those political convulsions which the love of conquest, inspired by conscious superiority in those arts, produces. All the nations of Europe, therefore, in the ruder and more early ages, may be considered as using only the same great primordial speech, grown indeed into distinct branches, and assuming in one country the appearance of being independent of, and unconnected with the found in other countries. Now, if we suppose that the Celts were the first emigrants from Asia, who, pervading Europe, settled in Gaul, Old Spain, Britain and Ireland; while their brethren, under the names of Cete (Goths), Scythar, Onlay, &c. directing their course to the North, occupied Thracia, Scandinavia, and other northern territories; it will follow, that these tribes, however remote, used at first either the same language, or languages which had a close affinity to their relation to the common primordial tongue. Nor would there be material difference in this conclusion, though we should suppose, with many learned men, that the inhabitants of the North of Europe descended from the East, and

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the North of Asia, as they must still have been descendants of the same primitive family, which, according to Moses, peopled the world. Thus the Celtic and the Gothic or Teutonic must have been, in their origin, the same or sister tongues.

But further, while the ancient Celts and Goths continued in the darkness for which they became proverbial, the inhabitants of Greece rapidly improved in laws and the arts of life. In this improved state, Greece became, in regard to the less favoured inhabitants of the North and West, what Asia had hitherto been in respect to Greece, a fresh source of civilization and letters. Its language, growing more copious and refined with the people, diffused itself with the blessings of knowledge and society, which their example or instruction imparted to the Northern and Western inhabitants of Europe. Thus Greek, with the arts of Greece imported into Italy, gave birth to the Latin tongue; and this at a later period necessarily affected the Celtic language, in consequence of the victories which the Roman arms achieved in Gaul and in Britain. This revolution greatly widened the line of distinction which for ages had been extending between the Celtic and the Gothic tongues; the former being assimilated to the Latin, the latter to the Greek, by a copious influx of new terms. It were indeed matter of great curiosity if some records of the Celtic and Gothic tongues had been preserved before they were yet modified by the ascendant languages of Greece and Rome; but no such records unfortunately have survived the wrecks of time. And we can judge of the ancient Celtic only from the Welsh, its acknowledged daughter; while we are left to form our judgment of the primitive Gothic from the remnants of a version of the New Testament, effected by Ulphilas, into the dialect used by the Goths in Mœsia, and hence called Mœso-Gothic.

Having made this preface to shew that the Celtic and Gothic had one common basis, viz. the primordial tongue imported from Asia, we proceed to prove, as far as we are able from their respective offspring, that they had in common many Asiatic words, and were modified by a great portion of Latin and Greek terms: and that from these two causes they essentially resembled each other. The Lord's prayer is thus rendered in the ancient Gothic of Ulphilas.

### Literal translation :

<p>1 Atta unfar thu in himin 2 Veihnai namo thein 3 Qaimai thiudinassus theins 4 Vairthai Vilga theins sue in himina, gah ana airthai 5 Hlaih unferana thana scintan gif uns himnidaga 6 Gah ahtet uns thatei seu-lans sigaima, sita sue gah veis ahtetam thum seulam unferan 7 Gah ni bringais uns in fraidubngai 8 Ak laute: uns ahtamina ubilan, Amen.</p>	<p>1 Father our thou in heaven 2 Be sanctified thy name 3 Come thy kingdom 4 Be done thy will so in heaven, also on earth 5 Give us this day the bread eternal 6 And forgive us that we are debtors, as also we forgive those our debtors 7 And bring us not into temptation 8 But deliver us from evil, Amen.</p>
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The following is a specimen of the Celtic, as existing in the Welsh tongue :

<p>1 Ein Taad, yr hwn wyt yn y Nefoeth 2 Santeiddier dy enw 3 Deved dy deyrnas 4 Bydded dy Ewyllys ar y ddaiar megis y mae yn y nevoeth 5 Dyro i ni heddyw ein bara beynyddiol 6 A madde i ni ein Dyledion fel y maddeuwn ni ein dyledwyr 7 Ag nae arwain ni i brofedigaeth 8 Eithr gwared ni rhag drwg, Amen.</p>	<p>1 Our father, the one who art in heaven 2 Be hallowed thy name 3 Come thy kingdom 4 Be thy will on the earth as it is in the heaven 5 Give to us this day our daily bread 6 And remit to us our debts as that we remit to our debtors 7 And lead us not into trial 8 But deliver us from evil, Amen.</p>
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We propose next to lay before our readers a brief analysis of these two specimens, which it is presumed will shew that the two languages in question have much nearer resemblance to each other, than Dr. Percy, or any person who has not a thorough knowledge of both, could possibly imagine. The Hebrew אָדָּא, *ad*, pronounced with an initial and closing vowel, is *ad*, and signifies *beloved*, and this is the source of the Gothic *atta*, and the Greek ἀγαπᾶται, with the utmost propriety applied to a parent as the dearest object of love. The same word in Hebrew is written אָדָּא, *ad*, and is no other than the Celtic *taad*, under a difference of character. In the Cornish it is *tas*, in the Frisic *kaita*, in the Lapland *atki*, and the old Cantabrian or Biscayan *aita*, father. *Unfar* is the Greek ἄντιστοιχία, thus strangely corrupted. ἄντι, *untar*, *unfar*; and hence the English *our*. In the same manner, ἄντι has degenerated into *uns*, *us*, *us*. The Celtic *ni* is the Hebrew and Arabic pronoun אָנִי, *ani*, which, sounded with only the closing vowel, is *ni*, *us*, and with only the initial *cin*, *our*. The Gothic *in* and the Welsh *yn* have originated in the Greek ἐν, or the Latin *in*; but it is observable that both these languages use this preposition as it is used in Latin, when followed by an accusative noun in the sense of *into*, *unto*, or *to*: thus *in fraidubngai*, into temptation; *inni*, or *i ni*, to us. The Welsh language is remarkable for the attention paid to harmony in the arrangement of its terms. To produce this effect the termination of a preceding word, in order to coalesce with the succeeding one, is somewhat changed, and thus made to unite both into one. Thus *rhawn* is *yr hwn*, the *one*, where *r* or *rh* (aspirated after the manner of the Greek ρ) is prefixed to *awn*, the Latin *anus*, or the Anglo-Saxon *an*. *Wyt*, moreover, is a coalition of *wyt ty*, *art thou*, or *thou art*; *wyt* being the substantive Greek verb εἶμι or εἶμι, whence the Goths derived their *im*, and the English *am*. The Greek χαλαρα, *tempet* or *clouds*, by softening the guttural into an aspirate, of which we shall presently give some more examples, has in the Gothic degenerated into *himin*, the place where the tempests or clouds reside, namely, the *sky* or *heaven*. In the Franco-Theotic the same word is *himil*, and in the Cimbric *himal*. It exists also in the Celtic; but there it has retained its original sound and sense, under the form of *camwell*, a *cloud*. It is singular that the same association of ideas, founded on the nature of things, has transferred the Greek ἀντι, or the Latin *antib*, to signify in Welsh *heaven*, under the shape of *ant* or *nefu*, *ad*.

2. *Veihnai* is the verb of *veiba* or *veibs*, *habe*, which is but the Greek ἀντι, with the labial *v* substituted for the aspirate, as the old Latins have done in numerous instances, some of which we shall presently produce. On the other hand, *santeiddier* is *sanctus*, converted by the Welsh into a verb; while



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*dy* is the same with the Gothic *thu*, and no other than the Latin *tu*, or the Æolic *tu*, or the English *thou*. The Gothic *thein*, it is obvious, has given birth to the English form of *thine*. *Namo*, whence our *name*, retains the Persian character of *naam*, though perhaps it is more immediately derived from *nomen*, and is a kindred noun with the Welsh *enw*, which probably degenerated from *enax*, by dropping the last syllable.

3. The Arabic **قَامَ**, *qaem*, *legs*, has given birth to the Gothic *quimar*, *to use the legs*, i. e. to come, and to the Anglo-Saxon *cymran*, and our *come*. The same word has been imported into the Celtic in the shape of *canmu*, signifying to *hop* or *step*. The same word exists in the Shanferit, *gunun*, *to go*. The corresponding Welsh *deved* or *dywad*, is the Greek **εζω**, **εζω**, or **εζω**, *to stretch to an object*, which last descended from the Arabic **اَضَمَّ**, *atz*, by dropping the initial vowel. The same verb exists in Welsh, under the different figure of *thoroy* or *thoroyas*, and is no other than the English *to go*, *to conduct*. The Gothic *thiudinassus*, *a kingdom*, seems originally to have meant the emperor of a *subdued nation*, from the Greek **βασις**; and **αυξ**, or **αυξου**, as the offspring of the former exists in this tongue *thiuda*, *gens*, *populus*. On the other hand, the Welsh *deyrnas* is the Greek **εβρα**, corrupted, by the transposition of *r*, into *thornos* or *dyrnas*. Our English *thron* conforms to the original in found and sense. In the Anglo-Saxon the corresponding word is *ryc*, which still exists in such English compositions, as *bishopric*, i. e. the dominion of a bishop. In the Great Indian language above-mentioned, this term subsists under the character of *rych*, meaning *wealth*, and which is nearly the same in found and sense with the Anglo-Saxon *ryc*, or our *rich*, and the Latin *res*, *property*.

4. As *light* or *air* is the chief medium of existence, the Hebrew term **אור**, *awar*, gave birth to the Latin *eram*, *ero*, and the Gothic *awir* or *wairthan*, *to be*, *to become*. The Welsh *bydded*, which exists also in the form of *byw*, and which is the same with the Greek **εω**, and the Latin *vivo*, descended from the Persian *bodan*, *to be*. *Wlga* is **εω**, or **εω**, with *ga* annexed, by an analogy common in the Gothic tongue. The Welsh *swylls*, or with *e* prefixed, *swylls*, has flowed from the same source; and under the former of these forms is nearly allied to the English *swill*. *Sue* is our *so*, or the Greek **ε** reversed, a fate very common with monosyllables in the ancient languages. *Gab* came from **εα**, and *ant* from **εα**, which, in composition, means *up*, and has given birth to the Gothic sense of *upon*. *Airthai* is the Arabic **ارث**, *arets*; while the Welsh *daïr*, or as it is otherwise written, *tyr*, originated in **ερα**. The Hebrew **אבר**, *aber*, the parent of **ερα** in Greek, of *aber* in German, *eser* in Gothic, and *over* in English, has contracted in Celtic into *ar*, in the sense of *upon*.

5. The Arabic **كَلِمَة**, *kalim*, *food*, is the origin of the Gothic *blais*, and the English *loaf*. *Thama*, or *than*, is the accusative article **τα**. *Sintain* is formed from the noun *smith*, *vicissitude*, *change*, which is no other than the Hebrew **שנה** or **שנה**, *smith*, that change or period of time called a year: hence *sintain* came to signify *continual*, or *perpetual*. Our Lord, we believe, by the clause **εσθιτε**, meant not, as it is generally rendered, *eat ye bread*; but the bread belonging to us, and essential to us as immortal beings, namely, the bread of the soul. (See Mr. Jones's *Illustrations of the four Gospels*, p. 123.) In this sense the clause was understood by the early commentators, and by the Gothic translator, who has rendered it *blais thana sintain*, the eternal bread. In Hebrew, Arabic, and Persian, **כף**, *kaph*, denotes the palm of the hand; hence it

came to signify the action of the hand, which consists either in imparting or receiving. In the former sense it gave birth to the Gothic *gif*, and in the latter to the Latin *castio*. *Hirnidaga* means *this day*; *kinna*, or as we write it, *kin*, being the personal pronoun used definitively, and *diga*, or *dag*, according to the Anglo-Saxon, being the Latin *dies*; *kin day* for *this day*, which is more common in the plural form among the vulgar *them days*.

The Welsh *dyro*, in the same verse, is the Greek **δ**, *a gift*, converted into a verb. *Heddyw* is a disguised form of *hadie*, which last is only a contraction of *had die*, *this day*. *Bara* is a word which exists in all languages. Its origin is the Hebrew **בָּרַךְ**, *pharash*, *fruit*; and hence **β** in Greek, *far*, and *pario* in Latin, *broth* in Cumbrie, *brat* in France, *brodt* in German, *branta* in Norle, *brat* in English, *brat* in Danish, and *brat* in Frisic. *Broddiddid*, rendered *daily*, appears to be composed of *bray*, *at* *for* or *formis*, and *yddid*, the Latin *dies* adjectived, and means a *top* of each day, or a head of each day, i. e. *daily*. The word is also used *brayyddid*, *bray* being a corruption of *par*, a head. The Welsh are fond of this expression, and have a phrase, *par ddy ar y pen*, each day on his head, meaning every day in succession.

6. *Asta uns*, i. e. *of-let*, or *let-off*, *dimissio* to us. *That* is a corruption of the Greek **ταυτα**, *this* or *that thing*, and is thus the parent of the English *that*; hence the reasonableness of the explanation which the celebrated Mr. Pooke has given of such phrases—*remitt* to us *that thing*, *viz.* *seculans seculans*, we are debtors. *Seculans* were persons under command, under obligation or debt, from the Greek **σουλαν**, *to labour*; hence appears to have been derived our *seulion*, a near domestic servant. In ancient times labourers usually paid their rents in kind from the products of their fields; hence, in Greek, the tenant was called **σουλαν**. On the same principle, in Gothic, the word signifying *to labour*, came to signify *to owe*, or *to be in debt*. *Sigimma* is only the Latin *sinus* corrupted by the insertion of *ga*, a particle of frequent use in Gothic. The Welsh *a math*, or as it may be written, *amathdu*, is a composite of *ag* *malde*, and *reitit*, the first being the Latin conjunction *at*, the second the Greek **μειν**, the same with **μειν**, *to dismiss* or *remitt*. *Dyledion*, the plural of *dyled*, is the Latin *dedit*, things to be *erased*, or to be cancelled by being paid, i. e. debts. The noun *tor*, or the plural *torr*, which in this tongue is to often added to the name of a thing, is but the Latin *tor*—*dyledtorr*, *debitum* or *debtors*.

7. The Goths and Anglo-Saxons corrupted **ερα** into *lecran* and *bringan*, and hence our *to bear*, and *to bring*—*ερα bringan*, do not bring us. The Latin *ε* in Gothic is *ni*, in Anglo-Saxon and English *u*, in Welsh *u* or *u*. *Fritulugan* is the corresponding noun of *tristitia*, *to tempt*, and appears to have been borrowed from the Latin *proba*, and therefore primarily meant *proba*, *temptation*. The Welsh *arain* is the French *rain* with the vowel *a* prefixed, and is the same with our *rain*; its proper sense is to lead a horse with a bridle. The French, in deriving words from the Latin, generally reject the guttural in the middle or at the end; and on this principle the root of *rene* is *re*, *to rule*, *re*, *to*. *Proflygath* strictly denotes *expulsion*, and its origin is the Latin *pro* *fl*, which last is itself taken from the Greek **πυρ**, *pyrre*, or the corresponding verb **πυρ**, *to* *take* or *burn*.

8. The Gothic *ad* is the Latin *at*, though used by the latter in a conjunctive, by the former in a disjunctive sense—*at*. The root is **αδ**, or the thence derived *auges*, whence the Gothic *augans* and *ad*, conformably to the form of this

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last verb, is also written *auð* in the sense of *nam, enim*. The corresponding Welsh word is *eithr*, derived from *επιτρος, another*. The explanation of it is this—lead us not into trial; another thing, *i. e.* do another thing, namely, deliver us from evil: on this principle the conjunction *αλλα, but*, originated in *αλλο*. *Laufes*, which has given birth to various words in Anglo-Saxon and in English, and among the number to *loose, lose, lease, release, let*, is apparently the offspring of the Hebrew לָזַח, *laz, decedo, recedo: to deliver* from evil is but to cause to recede from evil, and thus *laufen* corresponds in sense as well as in found to the original. A loose character is a character freed or loosened from the rules of sobriety and justice, and this deviation from rectitude is implied in the original לָזַח; while the compound *release* comes close to the Gothic signification of *laufan*, to deliver. The Welsh which answers to this is *gwared*, and is no other than the Latin *gero*, (properly pronounced *guero*.) *to manage, to carry*. The Arabic فَرَغَ, *pharâ*, is the origin of our word *free*, its primary sense. Being thence applied to men, it came to signify those who were the heads of families, or who went before them: hence it was used to convey the more general and abstract ideas of precedence or beginning; in this sense it is the origin of *πρῶτος* in Greek, *præ* in Latin, *fra* or *fram* in Gothic, *ifra* in Cimbric. In the Anglo-Saxon *m* is annexed, and hence our word *from*, though the Scotch use it in the original purity of *fræ*. The corresponding Welsh *rhag*, which means *far, distance*, has retained with great exactness the found and sense of רָחַק, *rbak*, its Hebrew original. The Gothic *ubil*, German *ubel*, Anglo-Saxon *ifle*, and English *evil*, is the Persian and Arabic بَلِيءٌ, *bali*, with a vowel prefixed. The Persian *tarik*, is the parent of the English *dark*: and as darkness was the symbol of *evil*, or of the supposed demon which created it, the Celts received it to express *evil* under the form of *dræg*: and it is remarkable that the same word with *alpha privativum* is used by the Greeks to denote a contrary sense—*απειρατος, not dark, ingenuous, sincere, true*. In the same language *επιπορευς* means an *impollor*, which the lexicographers, misled by mere familiarity of sound, have erroneously referred to *επιπορευς, to eat*.

From this analysis, which we hope is worthy the attention of the learned, we shall draw a few conclusions respecting the Gothic tongue. First, it appears to resemble the Celtic, in having a common Asiatic basis, and in containing a copious influx of Greek and Latin words. As the two languages were not essentially different, there is no foundation for supposing, with Dr. Percy, that the Celts and the Goths were originally distinct races of men. And here we cannot help specifying a feature in these tongues, which, in a remarkable manner, bespeaks their original identity, or their immediate descent from a common parent.

The Gothic, with its offspring the Anglo-Saxon and the German, uses the particle *ga* or *ge* prefixed to words, and especially to verbs. The Gothic sometimes inserts *g* in the middle of words, and frequently before the infinitive termination of verbs: *auþw*, or *auþwgan*, is *wahsgan*, and *gawra*, *to deride, blabgan, to laugh*. In consequence of this analogy, words borrowed from Greek and Latin are remarkably disguised, and they must be stripped of this peculiarity before they can be traced to their true origin. The Celtic, if we may judge from the Welsh, was distinguished by the same characteristic feature: thus, the Latin *vir* is *gior*; *vinum*, *gyn*; *vagus*, *gwaug*, &c. On this principle *επε*, *Eke, as*, in Welsh is *uagis*, which bears the sense of the original. The identity or similitude of the two languages will account for the Goths and Celts being called by the common name

of Cimmerians or Cimbri, which the true Britons, the undoubted descendants of the Celts, still inherit under the name of Cymri.

Sir W. Jones, in his sixth discourse delivered to the society at Calcutta on the antiquities of Asia, has the following passage well worthy of our attention, as tending to confirm, in a remarkable manner, the result of the preceding inquiry. The passage is this: “It has been proved by clear evidence and plain reasoning, that a powerful monarchy was established in Iran long before the Assyrian government; that it was in truth a Hindoo monarchy, though, if any chuse to call it Cuscan, Casdean, or Scythian, we shall not enter into a debate on mere names; that it subsisted many centuries, and that its history has been ingrafted on that of the Hindoos, who founded the monarchies of Ayodhya and Indraprestha; that the language of the first Persian empire was the mother of the Sanscrit, and, consequently, of the Zend and Parsi, as well as of Greek, Latin, and Gothic; that the language of the Assyrians was the parent of Chaldaic and Pahlavi, and that the primary Tartarian language also had been current in the same empire; although, as the Tartars had no books, or even letters, we cannot, with certainty, trace their unpolished and variable idioms. We discover, therefore, in Persia, at the earliest dawn of history, the three distinct races of men, whom we described on former occasions as possessors of India, Arabia, and Tartary; and whether they were collected in Iran from distant regions, or diverged from it, as from a common centre, we shall easily determine from the following considerations. Let us observe, in the first place, the central position of Iran, which is bounded by Arabia, by Tartary, and by India; whilst Arabia lies contiguous to Iran only, but is remote from Tartary, and divided even from the skirts of India by a considerable gulf. No country, therefore, but Persia seems likely to have sent forth its colonies to all the kingdoms of Asia: the Brammans could never have migrated from India to Iran, because they are expressly forbidden by their oldest existing laws to leave the region, which they inhabit at this day; the Arabs have not even a tradition of an emigration into Persia before Mohammed; nor had they, indeed, any inducement to quit their beautiful and extensive domains; and as to the Tartars, we have no trace in history of their departure from their plains and forests till the invasion of the Medes, who, according to etymologists, were the sons of Madai, and even they were conducted by princes of an Assyrian family. The three races, therefore, whom we have already mentioned, (and more than three we have not yet found,) migrated from Iran, as from their common country: and thus the Saxon Chronicle, I presume on good authority, brings the first inhabitants of Britain from Armenia; while a late very learned writer concludes, after all his laborious researches, that the Goths or Scythians came from Persia; and another contends, with great force, that both the Irish and Old Britons proceeded severally from the borders of the Caspian; a coincidence of conclusions from different media, by persons wholly unconnected, which could scarce have happened, if they were not grounded on solid principles. We may, therefore, hold this proposition firmly established, that Iran or Persia, in its largest sense, was the centre of population, of knowledge, of languages, and of arts; which, instead of travelling westward only, as it has been fancifully supposed, or eastward, as with equal reason might have been asserted, expanded in all directions to all the regions of the world.” Here we see it stated, as the result of Sir William Jones’s inquiry, that the Goths, the Irish, and the Old Britons, or the Celts, were originally the same people,

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and of Asiatic origin; that they used the same language derived from the primordial language of Asia: and this he gives not merely as the consequence of his own investigations, but as a coincidence of conclusions, through different media, by persons wholly unconnected." We know not whether this great man was aware of the great similitude subsisting between the Gothic and the Celtic tongues. From his silence we may conclude that he was not: and if he had seen specimens of them, analysed similar to that above, he would have deemed the resemblance a surprising confirmation of his theory.

We conclude, in the second place, from the above analysis, that the Gothic had a close affinity to the Greek and Latin. And sir William Jones gives it as his opinion, that the Greek, Latin, and Gothic originated in one and the same language; namely, the ancient language of Persia. These three languages, therefore, originally resembled each other, not merely because they borrowed some words one from the other, but because they had the same words, phrases, and even construction, in consequence of having derived them from a common tongue. And here we cannot help mentioning one feature in which the ancient Gothic bore a very singular resemblance to the Greek in the time of Homer, or that dialect of the Greek (namely, the Æolic), from which the Latin was principally derived: we mean the much disputed Æolic digamma. In the Oriental languages gutturals abounded: these, by degrees, softened into a mere aspirate; and for this aspirate was, in very numerous instances, substituted a labial letter *ϕ* or *ϕ*, or *ϕ*, or *ϕ*. Thus *κκίαν*, a king, degenerated into *hán*; and being introduced into Greek in the form of *ακξ*, or *ακξια*, was pronounced *ϕακξ*, *ϕακξια*. While the oral Greek was thus corrupted, the written retained the aspirate; and as the works of Homer became the subject of universal study, the true orthography triumphed over the caprice of oral sounds. But the Latins had no such monument of genius as the Iliad to study: the corruptions of pronunciation, therefore, prevailed, and the digamma was universally substituted for the aspirate. Thus *ἑσπερα*, *ἑσπερα*, *ἑσπερα*, *vespera*. The digamma was also prefixed to a broader open vowel, and always inserted between a diphthong, as *αι*, pronounced *σπαις*, *σπαις*; *οινον*, *σπαινον*, *vinum*; *οικος*, *σπαικος*, *vicus*. Now, this same digamma runs through the Gothic language, which shews that a great part of it, through some channel or other, was derived from the Greek, about the early age in which the Latin separated into a distinct dialect. We shall give a few examples of this fact. The Greek *ακξ*, in Gothic, is written conformably to the corrupt pronunciation of *ϕακξ*, *fin*; *σπαιρε*, *spirare*, is *weian*; *σπαιρε*, (which is equivalent to *σπαιρε*) is *weihgan*, *rescere*; *σπαιρε*, *weurhgan*; hence the English, *to work*.

But though the Greek may have the same form and basis with the Gothic; and though by some communications, now unknown, it may have enriched the Gothic with its own early improvements, yet the dialect dignified with this name is only the remains of the Gothic tongue, debased by a strong mixture of Greek and Latin terms, a century or two after the commencement of the Christian era. The Goths who used it lived in Wallachia, a country in which Roman colonies had been planted, and which was contiguous to the provinces of Greece. As the version of Ulfilas, contained in the "Codex Argenteus," is the only repository of this dialect, it is worth while to hear what Michaelis says of it in his "Remarks on the Ancient Versions," Marsh's translation, vol. ii. p. 142. "In the "Codex Argenteus," many words are adopted immediately from the Greek. Here I understand, not such as have been

common to the German and the Greek from the earliest ages of antiquity, and shew either an original relation, or original connection between the two nations, but such Greek words as are found in no other German dialect than that of the "Codex Argenteus," and have been transferred from the Greek, after the complete formation of both languages: for instance, *αττις*, *father*, *αμς*, *the shoulder*, *σπαιρε*, where even the *s* is retained from the Greek termination. *σπαιρε*, *spyrans*, *baylets*, *σπαιρε*; *ρλατιζο*, *casier*, *λατιζο*; *μακρο*, *greater*, *μαξον*; *ακξια*, (*ακξια*) *lakos*, *bill of divorc.* This betrays not a dialect that was used in Germany, or in the North, but that of a nation that lived in the neighbourhood of the Greeks. Even the mode of expressing the sound of *ng*, in the "Codex Argenteus," is purely Greek, and never used in Germany, where the Latin orthography has been received; for *finger* is written in that manuscript *figgr*, as the Greeks would have expressed it by a double-gamma." Ulfilas is said to have imitated the characters of this dialect; which are evidently a mixture of the Greek and Latin alphabet. The use of such characters was natural, if the dialect which they expressed contained a great mixture of the languages to which they properly belonged.

This representation must greatly diminish our veneration for the Gothic, as far as it can be known by us; yet, in this light, it demands our attention and respect as the undoubted parent of the English tongue. Nevertheless, we are hence compelled to regard the Gothic and the Anglo-Saxon as but corrupt channels by which the terms of Greece and Rome have been imported into our own language. There are, indeed, those who consider them in this humble and degraded state, as claiming the dignity of original, ancient, and independent languages. And Mr. Horne Tooke, in particular, in his celebrated work on grammar, has attempted to induce the public to receive corruptions from Greek and Latin in the dark ages, as the original words of a Northern language; whence Greek and Latin have, according to him, themselves been derived. The merits of this question will more properly be discussed under the articles GRAMMAR and GREEK. But if the account we have given of the Gothic be just, we shall want no other evidence to convince us that the theory of Mr. Tooke, as far as this question is concerned, (and it forms a very leading feature of his system,) is not only erroneous, but ridiculous and absurd.

*GOthic Medals.* See MEDALS.

*GOthic Music.* When sig. Eximeno calls fugues and canons Gothic compositions, he does not disgrace their structure any more than he would our cathedrals, by calling them Gothic buildings. Let fugues be banished from the theatre and private concerts, if he pleases, but let them remain in the church as a distinct species of composition, where they were first generated, and where they can never become vulgar or obsolete. The style is naturally grave, requires musical learning, and will, by the solemnity of the words and place of performance, continue to be revered and respected. It is allowed that variety is more wanted in music than in any other art, and by totally excluding canons and fugues from the church, the art would lose one capital source of variety, as well as ingenuity: and intelligent hearers be bereaved of a solemn style of music, to be heard no where else.

*GOTHINI*, or *GOTHUNI*, in *Ancient Geog.* *γοθη*, a name given to the Goths. They were called *Getones* by Tacitus and Justin, and *Guttones* by Pliny. Claudian calls them *Gothuni*.

GOTHLAND,

**GOTHLAND**, a country of Sweden, bounded on the N. by Sweden Proper, on the E. and S. by the Baltic, and on the W. by the Sound, the German ocean, and Norway. This country is inhabited by a people, who derived their origin from the Getae, or Tartars of the Crimea. The Goths had kings of their own, till the year 1132, when they were united to Sweden. The country is pleasant and fertile, consisting of pasture and arable land; and abounding in lakes and rivers plentifully stored with fish, and also with forests and mines. It contains 48 towns, and is divided into East, West, and South Gothland.

*East Gothland* is bounded on the N. by the provinces of Nericia or Nerike, and Sudermanland, on the E. by the Baltic, on the S. by Smoland or Smaland, and on the W. by the Wetter lake, which separates it from West Gothland. It is about 80 miles long, and 70 broad. It produces wheat, rye, barley, oats, pease, &c. in such abundance as to supply the neighbouring provinces. It has likewise many fine orchards, with meadows, pastures, lakes, and rivers abounding with fish, extensive forests, iron-mines and founderies, and quarries of stone and marble. The inhabitants are occupied in husbandry, hunting, and fishing, and also in some places in the mines. The chief towns of this province are Nordkiöping, Söderkiöping, Linköping, and Wadstena; which see respectively.

*Scrub Gothland* is divided into three provinces, viz. Skonen or Skone, Halland, and Blekingen, which have at sundry times changed their masters, till at length Charles Gustavus annexed them for perpetuity to the Swedish dominions, by the treaty of Roschild, in the year 1658.

*West Gothland* is bounded on the N. by Warmeland, on the E. by Nericia, the Wetter lake, and Smaland, on the S. by Smaland and Halland, and on the W. by the Scaggerae. It is about 115 miles long, and 15 broad; like East Gothland it was under the administration of its own kings and laws. The soil produces corn, vegetables, and fruit; and affords excellent pastures, which enable the occupiers to supply other provinces with butter and cheese. The rivers, lakes, and sea-coast abound with fish; and in several places are erected iron-forges, alum-works, paper mills. The inhabitants are chiefly employed in agriculture and fishing. The chief towns are Gothenburg, Wenneberg, Lidkiöping, and Falköping; which see respectively.

**GOTHLAND**, or *Gottland*, an island belonging to Sweden, situated in the Baltic, between N. lat. 56° 54' and 57° 56', and E. long. 18° 6', and 19° 6'; about 70 miles long and 25 in its greatest breadth. It was formerly an independent kingdom, but is now subject to the supreme court of justice at Stockholm. Its situation has gained for it the appropriate denomination of the "Eye of the Baltic." The soil is fertile, and affords fine woods of oak and pine, and good pastures; and its breed of sheep is accounted excellent. It has large quarries of stone, which is exported to Stockholm and other places, and some curious species of stone morals, carnelians, agates, and beautiful petrifications. It furnishes likewise good lime-stones, tar, and deal-boards. Although it is not infested with bears or wolves, it abounds with foxes, deer, and hares. The inhabitants gain their subsistence by tilling the ground, grazing, fishing, working in the quarries, burning lime, and other sorts of mechanic trades, and navigation. The peasants are in a state of absolute dependence on the burghers, who supply them with necessaries, and with money for paying their taxes, and to whom they surrender the whole produce of their industry, without stipulating any price. This island was at first sub-

ject to the crown of Sweden, and afterwards to the Danes for near two centuries, till the year 1645, when by the treaty of Bromsebro, it was restored to Sweden. The capital of the island is Wisby, on the western coast.

**GOTHS**, a people, who came originally, according to Jornandes (*Ret. Get.*) who abridges the Gothic history of the learned Cassiodorus, comprised in 12 books, from the vast island, or rather peninsula, called Scandinavia, and including the present Sweden, Norway, Lapland, and Finmark. The learned Grotius, and after him Sheringham, and most of the northern writers, maintain by arguments, which, as many conceive, have not been refuted, but which are not convincing to others, that the Cimbrians (see CIMBRI), Getae (see GETAE), and Goths, were the same nation; that Scandinavia was first peopled by them; and that from thence they detached colonies into the islands in the Baltic, the Chersonesus, and the adjacent places, yet destitute of inhabitants. Many vestiges, which cannot be ascribed to the arts of popular vanity, attest the ancient residence of the Goths in the countries beyond the Baltic. From the time of the geographer Ptolemy, the southern part of Sweden seems to have continued in the possession of the less enterprising remnant of the nation, and a large territory is even at present divided into East and West Gothland. (See GOTHLAND.) The time when the Goths first settled in Scandinavia, and the period at which they first peopled with their colonies the islands, the Chersonesus, and the neighbouring places, have not been ascertained. Some have said, that their first settlement was conducted by Eric, contemporary with Sarah, grandfather of Abraham. However this be, the peopling of the islands in the Baltic sea, of the Chersonesus, and of the adjacent places on the continent, is called by the Northern writers, the *first* emigration of the Goths or Getae. The attempt to cross the Baltic was natural and easy. The inhabitants of Sweden (as we learn from Tacitus) were masters of a sufficient number of large vessels with oars; and the distance is little more than 100 miles from Carlscroon to the nearest ports of Pomerania and Prussia. At least as early as the Christian era, and as late as the age of the Antonines, the Goths were established towards the mouth of the Vistula, and in that fertile province, where the commercial cities of Thorn, Elbing, Königsberg, and Dantzick were long afterwards founded. Westward of the Goths, the numerous tribes of the Vandals were spread along the banks of the Oder, and the sea-coast of Pomerania and Mecklenburg. A striking resemblance of manners, complexion, religion, and language, seemed to indicate that the Vandals and Goths were originally one great people. (See VANDALS.) In the age of the Antonines the Goths were still seated in Prussia. About the reign of Alexander Severus, they made frequent and destructive inroads into the Roman province of Dacia. In this interval, therefore, of about seventy years, we must place the *second* emigration of the Goths, from the Baltic to the Euxine. To what cause this was owing is matter of mere conjecture. Perhaps a pestilence or a famine, a victory or a defeat, an oracle of the gods, or the eloquence of a daring leader, were sufficient to impel the Gothic arms on the milder climates of the south. Besides the influence of a martial religion, the number and spirit of the Goths were equal to the most hazardous adventures. The use of round bucklers and short swords rendered them formidable in a close engagement; the manly obedience which they yielded to hereditary kings gave uncommon union and stability to their councils; and the renowned Amala, the hero of that age, and the tenth ancestor of Theodoric, king of Italy, enforced, by the ascendant of personal merit, the prerogative

of his birth, which he derived from the *anfes*, or demigods of the Gothic nation.

Whatever was the motive of their migration, they took their route eastward, entered Scythia, advanced to the Cimmerian Bosphorus, and, driving out the Cimmerians, settled in the neighbourhood of the Mæotic lake. Thence, in process of time, they sent out numerous colonies into Thrace, Dacia, Mæcia, or Italy, and lastly into the countries bordering on the Euxine sea, forcing every where the ancient inhabitants to abandon their native abodes. Such is the account given by Jornandes, and Ablavius, a celebrated writer among the Goths, who lived long before him. In the vicinity of the Mæotic lake, they had, it is said, Filimir for their king, who was a warlike prince; in Thrace, Mæcia, and Dacia, Xamolxis, a great philosopher: and in the countries on the Euxine sea, princes of the illustrious families of the Balthe and the Amali, the Visigoths being subject to the former, and the Ostrogoths to the latter. In all these countries they were the same people, though subject to different princes, and known by various appellations. As for the denominations of Westrogoths, softened by the Latins into that of Visigoths, and Ostrogoths, they were distinguished by those names before they left Scandinavia, being called Westrogoths and Ostrogoths, or western and eastern Goths, from their situation to the west and east, the former inhabiting that part of Scandinavia which borders on Denmark, and the latter the more eastern parts, near the Baltic. The information we derive from Jornandes concerning the various migrations and settlements of the Goths is conformable to the accounts that are given by the ancient Greek and Latin authors with respect to the different colonies and settlements of the Getes. That the Goths and Getes were the same people, is supposed by all the writers who flourished in or near the times in which both empires were overrun by them. Those authors, without doubt well acquainted with their origin, call them sometimes Goths, sometimes Getes, and sometimes Scythians; and several authors tell us, that the Getes and Goths had been long known to the Romans, and also to the Greeks by the former names, but not by the latter, till their incursions into the empire.

When the Goths greatly increased in Scythia, they resolved to seek new settlements; and accordingly, pursuing their route eastward, and travelling through several countries, they returned at length into Germany. Their leader in this migration was the celebrated Woden or Odin, of whom many strange things are related. It is said by the northern writers, that he was king of the Afgardians, supposed to be the same people with the Aspurgiens mentioned by Ptolemy and Strabo. Afgardia and Aspurgia are said to be a common name of their city, situated, according to Strabo, near Bosphorus Cimmerius; and Aspurgia was the metropolis of a country which Strabo calls Asia; hence Woden and his followers are styled by the ancient Gothic writers *Afe*, *Asiani*, and *Asiate*. The kings of Aspurgia are represented as being masters of all that part of Scythia that lay west of mount Imaus, and which the Latins called "Scythia intra Imaum," or Scythia within mount Imaus. Of this Afgardia or Aspurgia, Woden is said to have been king; and hence he emigrated with a great multitude of his followers in quest of new settlements; or, as some say, with the great design of forming in Sweden, considered as the inaccessible retreat of freedom, a religion and a people, which, in some remote age, might be subservient to his purposes; when his invincible Goths, armed with martial fanaticism, should issue in numerous swarms from the vicinity of the Polar circle to chastise the oppressors of mankind. Having passed through different countries, and perform-

ed a variety of exploits, he at length arrived in Sweden, where he was allowed to settle, and where he reigned till his death. His name became so famous that the northern nations ranked him among the gods, and worshipped him with divine honours. He is supposed to have brought with him out of Asia the Runic characters (see Runic), and to have taught the northern nations the art of poetry; whence he is called the father of the Scaldi or Scalds. See SCALD.

That the Goths, under the conduct of Woden, came from Scythia into the northern parts of Germany, is a received opinion among the northern writers, and is thereby confirmed by an immemorial tradition, by the ancient chronicles of those countries, and by many monuments and inscriptions in Runic characters, some of which are still to be seen in Sweden, Denmark, and the north coast of Norway. That there were such migrations can be easily demonstrated, since we find the same names common to the inhabitants of Scandinavia and Asiatic Scythia, and likewise the same language, as Grotius, and after him Sheringham, have shown. The ancient language of the Goths is now spoken by the Tartars of Precop, whence, and from other collateral circumstances, it has been concluded that the Semibar Goths and Asiatic Scythians had one and the same original. As to the time of this migration of Scythians under Woden into the northern parts of Germany, those who maintain it have not been able to determine. Some refer it to a period about 24 years P. C.; for at that time, they say, Pompey laid waste Syria, and great part of Asia, and menaced the north with conquest. After all, this wonderful expedition of Woden or Odin is admitted with great hesitation, or indeed scarcely admitted at all by many, into authentic history. According to the obvious sense of the Edda (see EDDA), and the interpretation of the most skillful critics, *Mgard*, instead of denoting a real city of the Asiatic Sarmatia, is the fictitious appellation of the mythic abode of the gods, the Olympus of Scandinavia; from whence the prophet was supposed to descend, when he announced his new religion to the German nations, who were already seated in the southern parts of Sweden.

Before we proceed with our brief abstract of the History of the Goths, we shall give some account of their manners, customs, laws, and religion, before they embraced Christianity. With regard to their general disposition and character, they were celebrated for their hospitality and kindness to strangers; and it is said that they derived their name from their being eminently good; the name of Goth being derived, according to Grotius and other writers, from the German word *got*, signifying *good*. They encouraged, says Dio, the study of philosophy more than any other barbarous or foreign nation, and often selected their kings from among their philosophers. Polygamy was not only allowed, but encouraged, and every one was respected according to the number of his wives, and of course his children. Adultery with them was a capital crime, and invariably punished with death. Theft, severity, and likewise polygamy, prevailed among them, when they were known to the Greeks and Romans by the name of Getes, as appears from the poet Mevius, who was himself a Gete, and from Horace (lib. ii. od. 24.) who bestows great encomiums on the virtue and chastity of their women. Of their laws we shall have occasion to speak in the sequel of this article. Their government was not monarchical. Their religion seems to have been the same with that of the ancient inhabitants of Scandinavia and Saxony; which see respectively. Till the end of the eleventh century, a celebrated temple subsisted at Uppal, the most considerable town of the Swedes and Goths. This temple was enriched with the gold which the Scandinavians had acquired

in their piratical adventures, and sanctified by the uncouth representations of the three principal deities, the god of war, the goddess of generation, and the god of thunder. In the general festival that was solemnized every ninth year, nine animals of every species (without excepting the human) were sacrificed, and their bleeding bodies suspended in the sacred grove adjacent to the temple. The only traces that now subsist of this barbaric superstition are contained in the *Edda*; which see. See also ODIN.

Caracalla was the first Roman emperor who quarrelled with the Goths, and marched against them into that part of Dacia, north of the Danube, of which they had taken possession; but the advantages which he seems to have gained over them in a few skirmishes were very inconsiderable. It appears, that the Romans were alarmed at an early period by the progress of this warlike nation; for in the reign of Alexander, which began in 222, considerable sums of money were sent to them from Rome, in order to prevent their disturbing the peace of the empire. Notwithstanding these bribes, as soon as they heard of the assassination of the emperor Maximin, who was of Gothic extraction, they resolved to revenge it, and accordingly entering Mœsia, they totally laid waste that province. Not long after they made themselves masters of Thrace, from which they were driven by Gordian. Under Philip, his successor, they committed dreadful ravages both in Thrace and Mœsia. Soon after their retreat from the siege of Marcianopolis, the capital of the second Mœsia, and after having compelled the inhabitants to ransom their lives and property, they passed the Danube a second time, under the command of their king, Cniva, with a more considerable force; and having obliged Darius the son of the Roman emperor, to save himself by flight, they were opposed by the emperor himself. Darius, having compelled them to raise the siege of Nicopolis, they retired towards Philippopolis, took it by storm, and massacred, as is said, 100,000 persons in the sack of that city. The time, however, which was consumed in this tedious siege, enabled Darius to revive the courage, restore the discipline, and recruit the number of his troops, after the defeat they had sustained in their pursuit of the Goths. Thus recruited, the emperor exerted his utmost vigilance to oppose either the progress or the retreat of the barbarians. The Goths were now, on every side, surrounded and pursued by the Roman arms; and exhausted by the long siege of Philippopolis, they would gladly have purchased, by the surrender of all their booty and prisoners, the permission of an undisturbed retreat. The emperor, confident of victory, refused to listen to any terms of accommodation; and the high-spirited barbarians preferred death to slavery. The two armies, therefore, prepared for an engagement. The conflict was severe; two lines of the Gothic army were thrown into disorder; and the third only remained entire, prepared to dispute the passage of a morass, which was imprudently attempted by the Roman troops. Here the fortune of the day assumed a new aspect. In this morass the Roman army, borne down by the weight of their armour, after an ineffectual struggle, was irrecoverably lost; nor could the body of the emperor ever be found. Upon the election of Gallus A. D. 251, the first object of his attention was to deliver the Illyrian provinces from the intolerable weight of the victorious Goths. He offered them every inducement in his power to withdraw their forces; and he even promised to pay them annually a large sum of gold, on condition they should never afterwards infect the Roman territories by their incursions. This tribute, however, though granted at the expence of the honour of the Romans, was insufficient to secure their permanent repose.

New swarms of barbarians, encouraged by the success, and conceiving themselves not bound by the obligation of their brethren, spread devastation through the Illyrian provinces, and terror as far as the gates of Rome. In this period of alarm and distress, Æmilianus, governor of Pannonia and Mœsia, rallied the scattered forces of the empire; and the barbarians were unexpectedly attacked, routed, chased, and pursued beyond the Danube. Under the reigns of Valerian and Gallienus, the frontier of the last-mentioned river was perpetually infested by the incursions of the Germans and Sarmatians; but it was defended by the Romans with more than usual firmness and success. Nevertheless, the great stream of the Gothic hostilities was diverted into a very different channel. The Goths, in their new settlement of the Ukraine, soon became masters of the northern coast of the Euxine; to the south of that inland sea were situated the wealthy provinces of Asia Minor, which possessed all that could attract, and nothing that could resist, a barbarian conqueror. The little kingdom of Bosphorus, whose capital was situated on the straits, through which the Mæotis communicates itself to the Euxine, was composed of degenerate Greeks, and half-civilized barbarians. In this small kingdom, domestic factions, and the fears, or interest, of obscure usurpers, who seized on the vacant throne, admitted the Goths into the heart of Bosphorus.

Here they acquired a naval force sufficient to transport their troops to the coast of Asia. For this purpose, they constructed a sort of flat-bottomed boats, called "Camarae," framed of timber only, without any iron, and occasionally covered with a shelving roof, on the appearance of a tempest. With this kind of fleet, they first appeared before Pityus, at the utmost limit of the Roman provinces, with a convenient port, and fortified with a strong wall. Their first attack was repulsed; but, renewing their attempts, they destroyed this city. Then circling round the eastern extremity of the Euxine sea, their navigation from Pityus to Trebisond was a course of about 300 miles. This city was large and populous, defended by a double inclosure of walls, and had its usual garrison strengthened by a reinforcement of 10,000 men. But this numerous garrison was dissolved in riot and luxury, and thus rendered careless in guarding their impregnable fortifications. The Goths, availing themselves of the supine negligence of the besieged, crested a lofty pile of fascines, ascended the walls in the silence of the night, entered the defenceless city, sword in hand, massacred the inhabitants, destroyed the temples and splendid edifices, and gained an immense booty. With the rich spoils of the city they filled a great fleet of ships, which they found in the port, and, satisfied with the success of their first naval expedition, returned in triumph to their new establishments in the kingdom of the Bosphorus. In their second naval expedition, possessed of greater powers both of men and ships, they took a new course, followed the western coast of the Euxine, passed before the wide mouths of the Borysthenes, the Nieker, and the Danube; and increasing their fleet by a great number of fishing barks, they approached the narrow outlet through which the Euxine sea pours its waters into the Mediterranean. In this expedition they plundered the cities of Bithynia, Chalcedon, Nice, Prusa, Apamea, Cius, and Nicomedia. From the recent attack of Prusa, the Goths advanced within 18 miles of Cyzicus; but their progress was stopped by the small river Rhyndacus, which issues from the lake Apolloniates, and which was then swelled into a broad and rapid stream. Their retreat to the maritime city of Heraclea, where their fleet was probably stationed, was attended by a long train of waggons, laden with the spoils of Bithynia,



and was marked by the flames of Nice and Nicomedia, which they wantonly burnt. The third naval expedition of the Goths consisted of 500 sail of transports, containing about 15,000 warriors. They now steered their destructive course from the Cimærian to the Thracian Bosphorus; and were carried to the lake of the Propontis. Their landing on the little island of Cyzicus was followed by the ruin of that ancient and noble city. They thence issued through the narrow passage of the Hellespont, and pursued their winding navigation amidst the numerous islands scattered over the Archipelago, or Ægean sea. At length the Gothic fleet anchored in the port of Piræus, five miles from Athens, ravaged Greece, and caused the rage of war, both by land and sea, to spread from the eastern point of Sardinia, to the western coast of Epirus, advancing within sight of Italy. The indolent Gallenus was roused; the emperor appeared in arms; and his presence contributed to check the ardour of the enemy. Some of the numerous Gothic host broke into Mœsia, for the purpose of forcing their way over the Danube to their settlements in the Ukraine. Others returned on board their vessels, and re-tracing their course through the Hellespont and the Bosphorus, and finding themselves secure within the basin of the Euxine, landed at Anchialus, in Thrace, near the foot of mount Hæmus, and refreshed themselves by the use of those pleasant and salutary hot-baths. Amidst their devastations, we may select the destruction of the famous temple of Diana at Ephesus, which they burnt in their third naval invasion. It is also said, that they threatened to destroy all the libraries of Athens, but were prevented from executing their menace by the profound observation of one of their chiefs, that as long as the Greeks were addicted to the study of books, they would never apply themselves to the exercise of arms. Under the reign of Claudius, A. D. 269, the Goths collected an armament more formidable than any that had yet issued from the Euxine. On the banks of the Niester they constructed a fleet of 2000, or even of 6000 vessels, which, in their passage through the Bosphorus, encountered various disasters. However, they made several descents on the coasts, both of Europe and Asia. But discontent and division arose in the fleet, and some of their chiefs deserted them, and sailed away towards Crete and Cyprus: the main body, nevertheless, pursued their course, anchored at the foot of mount Athos, and assaulted the city of Thessalonica. Their attacks were soon interrupted by the rapid approach of Claudius. The Goths, eager for a general engagement, relinquished the siege of Thessalonica; and with this view, leaving their navy at the foot of mount Athos, traversed the hills of Macedonia. Claudius was distressed, but at the same time firm and determined. The event exceeded even his own expectations, as well as those of the world; and having gained signal victories, and delivered the empire from this host of barbarians, he was distinguished by posterity under the glorious appellation of the Gothic Claudius. The decisive battle was fought near Naïssus, a city of Dardania. The war was afterwards diffused over the provinces of Mœsia, Thrace, and Macedonia, and the superior talents of the emperor generally ensured the success of his arms. The Goths suffered to such a degree, that a select body of their youth was received among the Imperial troops, the remainder was sold into servitude, and the female captives were so numerous, that every soldier appropriated to himself two or three women. To complete the disasters of the Goths, their fleet was either taken or sunk, so that their retreat was thus intercepted. Aurelian, the successor of Claudius, distinguished himself during the Gothic war, and, at last, put an end to

it by a lasting and beneficial treaty. The emperor was engaged to supply the provinces of Roman Gaul with a fleet of 2000 auxiliaries, consisting entirely of cavalry, and to regulate a well-timed and undisturbed trade, with a regular market as far as the Danube, provided by the emperor's care, but at their own expence. But the most important condition of peace was understood rather than expressed in the treaty. Aurelian withdrew the Roman force from Dacia, and tacitly relinquished that great province to the Goths and Vandals. This proved, in the event, a wise measure; for, after Dacia became an independent state, it served as the firmest barrier of the empire against the invasions of the savages of the North.

About the year 273, the second of the reign of Probus, the Goths entered Thrace, and advanced as far as Illyricum, laying waste the country with fire and sword; but as soon as they heard that the emperor was marching against them, they retreated and left their booty behind them. In Illyricum, Probus was met by deputies from the Gothic nations, suing for peace, and submitting to his power. No further mention is made of the Goths till the year 289, at which time Dioclesian is said to have gained a complete victory over them. From this victory Dioclesian assumed the name of "Sarmaticus," as appears from several ancient coins and inscriptions. From this year to the 15th of Constantine, the Goths gave no disturbance to the empire, being engaged in wars with the neighbouring nations. As soon as the Goths were disengaged from other wars, they invaded the Roman empire; but they were overcome by Constantine in several battles, fought at Campana, in Pannonia, and at Margus and Bononia, in Upper Mœsia. The emperor determined to chastise as well as to repulse the insolent barbarians who had dared to attack the territories of Rome, passed the Danube, and penetrated into the inmost recesses of Dacia; and when he had inflicted a severe revenge, condescended to give place to the suppliant Goths, on condition that as often as they were required, they should supply his army with a body of 4000 soldiers. In the year 331, a war broke out between the Goths and Sarmatians; on which occasion the latter had recourse to Constantine, who was glad to embrace an opportunity of humbling that ferocious nation. In the first action the barbarians gained the advantage; but the event of a second and more successful action, in April 332, retrieved the honour of the Roman name. Near 100,000 of the enemy were either put to the sword, or perished after the battle with hunger and cold; and this defeat was so signal, as to oblige Alaric, king of the Goths, to sue for peace, and to deliver hostages to the emperor, one of whom was his own son. The Goths not only continued quiet, but served the Romans with great fidelity, during the remaining part of Constantine's reign; and in the reigns of Constant, Julian, Trajan, and Valentinian I. But in the first of Valens, they made inroads into Thrace, and laid waste that province. The emperor purchased their retreat for a sum of money. In the following year news was brought him to Bithynia, that the Goths were again ready to break into Thrace. When Procopius revolted, and assumed the title of emperor, the Goths espoused his cause, and sent a body of troops to his assistance; but before their arrival, he was defeated and put to death. They, however, continued in the territories of the empire, committing great ravages in Thrace and Mœsia. Valens sent a strong detachment against them, and their retreat being cut off, they were obliged to lay down their arms, and yield themselves prisoners. After hostilities which lasted three years from 366 to 369, the barbarians submitted, and thus appeared the resentment of Valens. After the ratification of the treaty, Valens returned in triumph to Constantinople,

stantinople, and the East remained in a state of tranquillity about six years; till they were violently impelled against the Roman empire by an innumerable host of Scythians, who appeared to issue from the frozen regions of the North. In the year 375 the Huns invaded the territories of the Goths, and spread among them such a general consternation, that they fled for refuge to the Roman dominions. Valens listened to their supplications, and granted them protection. The liberality of the emperor, however, was accompanied with too harsh and rigorous conditions. Before they passed the Danube, they were required to deliver their arms; and it was insisted that their children should be taken from them, and dispersed through the provinces of Asia; where they might be civilized by the arts of education, and serve as hostages to secure the fidelity of their parents. A probable testimony has fixed the number of the Gothic warriors at 200,000 men; and if we can venture to add the just proportion of women, of children, and of slaves, the whole mass of people which composed this formidable emigration must have amounted to near a million of persons, of both sexes and of all ages. The Goths, justly provoked at the cruel treatment they met with from the Roman officers, who were to supply them with provisions, had scarcely entered Thrace, under the conditions imposed upon them, when they began to mutiny and plunder the country. This occasioned a long and bloody war between them and the Romans. They were joined by the Huns, Alani, Tiofats, and other swarms of their countrymen. In the battle of Hadrianople, A. D. 378, the Roman cavalry fled; and the infantry was abandoned, surrounded, and cut in pieces; and though the Goths were obliged to raise the siege of Hadrianople, the tide of the Gothic inundation rolled from the walls of this city to the suburbs of Constantinople; and the Roman provinces were ravaged by the barbarians. At this time a suspicion prevailed, that the Goths of Asia had formed a secret and dangerous conspiracy against the public safety. An order was promulgated that, on a stated day, the Gothic youth should assemble in the capital cities of their respective provinces; and as a report was industriously circulated, that they were summoned to receive a liberal gift of land and money, the pleasing hope allayed the fury of their resentment, and perhaps suspended the motions of the conspiracy. On the appointed day, the unarmed crowd of the Gothic youth assembled in the square, or forum; the streets and avenues were occupied by the Roman troops; and the roofs of the houses were covered with archers and slingers. At the same time in all the cities of the East, the signal was given of indiscriminate slaughter; and the provinces of Asia were delivered by the cruel prudence of Julius, who was master-general of the troops, from a domestic enemy, who, in a few months, might have carried fire and sword from the Hellespont to the Euphrates. At length the Goths submitted to Theodosius I., and were allowed by him to settle in Thrace and Meſia, which two provinces had been almost depopulated by the frequent incursions of the neighbouring barbarians, and the late destructive war. A numerous colony of the Visigoths was settled in Thrace; the remains of the Ostrogoths were planted in Phrygia and Lydia; their immediate wants were supplied by a distribution of corn and cattle; and their future industry was encouraged by an exemption from tribute for a certain number of years. Hopes were entertained that the manners of the barbarians would in time be polished, and that their posterity would be insensibly blended with the body of the Roman people. Notwithstanding these flattering expectations, it was apparent to every discerning eye, that the Goths would long remain the enemies, and might soon become the

conquerors of the Roman empire. As the impatient Goths could only be restrained by the firm and temperate character of Theodosius, the public safety seemed to depend on the life and abilities of a single man. He died in the month of January A. D. 395, and before the end of the winter of the same year, the Gothic nation was in arms. The interruption, or at least the diminution, of the subsidy which the Goths had received from the prudent liberality of Theodosius, was the specious pretence of their revolt. Instead of being impelled by the blind and headstrong passions of their chiefs, they were now directed by the bold and artful genius of Alaric. In the year 396 Alaric marches into Greece; and he hastened to occupy the city of Athens, and the important harbour of the Piræus. Corinth, Argos, and Sparta yielded without resistance to the arms of the Goths. From Thermopylæ to Sparta, the leader of the Goths pursued his victorious march, without encountering any mortal antagonists; and the Christian faith, which he had devoutly embraced, taught him to despise the imaginary deities of Rome and Athens. In 397 Stilicho, the general of the West, advanced to chastise the invaders of Greece. The skill and perseverance of the Roman at length prevailed; and the Goths, after sustaining a considerable loss by disease and desertion, gradually retreated to the lofty mountains of Phœlœ, near the sources of the Penens, and on the frontiers of Elis; a sacred country, which had formerly been exempted from the calamities of war. Their camp was immediately besieged; and reduced to great distress by thirst and hunger. A strong line of circumvallation was formed to prevent their escape. Alaric was secret, prudent, and rapid in his operations; he immediately negotiated a treaty with the ministers of Constantinople; and Stilicho was compelled to retire from the dominions of Arcadius; and he respected, in the enemy of Rome, the honourable character of the ally and servant of the emperor of the East. Alaric is declared master-general of the Eastern Illyricum; and the use to which he applied his new command distinguishes the firm and judicious character of his policy. He issues his orders to the four magazines of offensive and defensive arms, Margus, Ratiaria, Naissus, and Thessalonica, to provide his troops with an extraordinary supply of shields, helmets, swords, and spears. With the unanimous consent of the barbarian chieftains, the master-general of Illyricum was elevated, according to ancient custom, on a shield, and solemnly proclaimed king of the Visigoths. Thus armed with double power, and seated on the verge of the two empires, he amused the two emperors Arcadius and Honorius, till he declared and executed his resolution of invading the dominions of the West. He was tempted by the fame, the beauty, and the wealth of Italy, which he had twice visited; and he secretly aspired to plant the Gothic standard on the walls of Rome, and to enrich his army with the accumulated spoils of three hundred triumphs. Alaric loses no time in executing his purpose of invading Italy, and advances, against much opposition, towards the capital of the empire. It was in the year 400 that he first entered Italy, making dreadful ravages in his progress. His march, probably from Thessalonica, through the warlike and hostile country of Pannonia, as far as the foot of the Julian Alps; his passage of those mountains, which were strongly guarded by troops and entrenchments; the siege of Aquileia, and the conquest of the provinces of Istria and Venetia, appear to have employed a considerable time. In the year 403, Alaric approached Milan, and the emperor Honorius, dreading his arrival, fled to Ravenna. Stilicho, however, prepared to march against the enemy, whom he found encamped at Pollentia, on the Tanaro, in Piedmont. While the

Christian Goths were devoutly celebrating Easter, they were attacked by Stilicho, and after a very severe engagement, they retreated from the field of battle, after the total defeat of the infantry, with their cavalry entire, under the command of Alaric, who possessed a mind, that was invincible and superior to misfortune, and that derived new resources from adversity. The Gothic sovereign, wishing to distinguish his retreat by some illustrious exploit, attacked Verona, but in the battle that ensued he suffered a defeat no less disastrous than that at Pollentia. In the year 408 Alaric marched again towards Rome; with bold and rapid marches he passed the Alps and the Po; hastily pillaged the cities of Aquileia, Altinum, Concordia, and Cremona; increased his forces by the accession of 50,000 auxiliaries; and, without meeting a single enemy in the field, advanced as far as the edge of the morass, which protected the impregnable residence of the emperor of the West. He soon after pitched his camp under the walls of Rome. A ransom having been offered and accepted, he raised the siege A. D. 409. Alaric's next attack was directed against the port of Ostia, one of the boldest and most stupendous works of Roman magnificence; and as soon as he was in possession of this important place, he summoned the city to surrender at discretion; but he contented himself with superseding Honorius, and bestowing the purple on Attalus, prefect of the city. Attalus was soon after degraded, and his degradation was followed by the third siege and sack of Rome, Aug. 24, A. D. 410. At the hour of midnight the Salarian gate was silently opened, and the inhabitants were awakened by the tremendous sound of the Gothic trumpet. Eleven hundred and sixty-three years after the foundation of Rome, the Imperial city, which had subdued and civilized so considerable a part of mankind, was delivered to the licentious fury of the tribes of Germany and Scythia. After six days' pillage and devastation, the victorious Goths evacuated Rome, and their intrepid leader advanced into Campania, and having ravaged that and the neighbouring provinces of Lucania, Samnium, Apulia, and Calabria, he approached the straits of Sicily, with a design to pass over into that island, and thence into Africa; but he was seized in the neighbourhood of Rhegium with a fit of illness, of which he died in a few days. (See ALARIC.) He was succeeded in the Gothic throne by his brother-in-law Ataulphus, or Adolphus, who concluded a peace with the empire, and marched into Gaul A. D. 412. Being driven out of Gaul A. D. 415, he retired to Spain, where he was soon after assassinated. Jingeric, his successor on the Gothic throne, shared the same fate. After his death the free choice of the nation bestowed the Gothic sceptre on Vallia or Wallia, who concluded a peace with the Romans, and commenced a sanguinary, but successful war with the barbarians, who had settled in Spain. His victorious Goths, A. D. 419, forty-three years after they had passed the Danube, were established, according to the faith of treaties, in the possession of the second Aquitain, a maritime province between the Garonne and the Loire, under the civil and ecclesiastical jurisdiction of Bourdeaux. The Gothic limits were afterwards enlarged by the additional grant of some neighbouring dioceses; and the successors of Alaric fixed their royal residence at Thouloufe. Thus, about the same time, in the last year of the reign of Honorius, the Goths, the Burgundians, and the Franks, obtained a permanent seat and dominion in the provinces of Gaul. Vallia was succeeded by Theodoric, who first made war with the Romans, and gained several places in Gaul belonging to them, and afterwards concluded a peace with them. The Goths continued quiet in the countries that had been allotted them in Gaul for the space of ten years, or till the

year 426, when, the Romans being engaged with the Burgundians, Theodoric availed himself of that opportunity to enlarge his dominions. At length the Gothic king made peace with the Romans; and in the year 453 engaged by an alliance with them to fight against the Huns, who had entered Gaul. Theodoric, his son and successor, breaks with the Romans; but his brother Theodoric, who next occupied the Gothic throne, and who was eminently distinguished by his talents and attainments, cultivated the friendship of the Romans, and contributed by his martial exploits to the support of the Roman empire. Theodoric entered Spain with a large army of Goths and Burgundians; and having almost reduced the Spaniards in Galicia, A. D. 457, he passed from thence into Lusitania, and reduced several places. Upon his return to Gaul, he took several cities belonging to the Romans; but at length checked in his career and defeated by Maximian, commander in chief of the Roman forces in that country. In Spain the Goths were more successful than they were in Gaul, and became masters of the greater part of the country. Under Euric, who ascended the throne A. D. 466, the Goths drove the Romans out of Spain; and all the provinces, except Galicia, and part of Lusitania, which was subject to the Suevians, acknowledged him for their king, who residing at Thouloufe, governed them by his lieutenants. Euric, having also made himself master of the best part of Gaul, comprising the whole tract between the Rhone and the Loire, and of the greatest part of Spain, was desirous of reducing the remaining parts of both countries, when his death at Arles, A. D. 484, put a stop to his great designs. Euric is said to have been the first who gave written laws to the Goths; for till his reign they had been governed by customs only; and for this purpose he employed Leo, his prime minister, one of the most learned men, and best civilians of that period. These laws were called the "Theodorician" laws; and were obtained by Euric upon the people of Gaul and Spain, who had been long accustomed to the Roman laws; but Alaric, his son and successor, restored the Roman laws to their former authority, and caused them to be observed through out his dominions. About this period the kingdom of the Visigoths in Gaul terminated; and they, being driven from thence, fixed their royal seat at Toledo, in Spain. (See VISIGOTHS.) For the history of the Ostrogoths; see OSTROGOTHS. Under Theodoric, who, A. D. 473, caused himself to be proclaimed by his Goths king of Italy, and was acknowledged as such by the emperor Anastas, the successor of Zeno, Theodoric secured his new kingdom by alliances with neighbouring powers; he quartered all his Goths in the castles or strong holds, with their officers who were to command them in time of war, and govern them in time of peace; he retained the Roman laws, the same form of government, the same distribution of provinces, the same magistracies and dignities; and besides, according to the custom of the Goths, he appointed for each city inferior judges, distinguished by the title of counts, who were to administer justice, and decide all disputes; and in this respect the polity of the Goths, as Grotius observes, far excelled that of the Romans. Thus Italy, from the dominion of the Romans, fell under that of the Goths, almost without any perceptible change. See THEODORIC.

At subsequent periods attempts were made to recover the country from subjection to their government; particularly in the reign of Justinian. Under the weak reign of Theodatus, the Gothic king of Italy, Belisarius invaded Italy, entered Rome A. D. 536, and reduced Naples A. D. 537. He defended Rome against the whole army of the Goths.

Goths, who besieged it A. D. 537, and continued it above a year till their final departure. During this siege, which was raised in March, A. D. 538, one-third of their enormous host was destroyed in frequent and bloody combats under the walls of the city, and the evils of famine and pestilence were aggravated by their own licentiousness, and the unfriendly disposition of the country. Vitiger, their king, retired for shelter within the walls and morasses of Ravenna. At length Belisarius besieged the city, and took it in the latter end of the year 539. The submission of the capital was imitated in the town and villages of Italy; and the independent Goths who remained in arms at Pavia and Verona, were ambitious only to become the subjects of Belisarius. But his inflexible loyalty rejected, except as the substitute of Justinian, their oaths of allegiance. In the year 540, the Goths revolted, and Totila, the nephew of their late king, undertook the restoration of the kingdom of Italy. His first movements were rapid and successful; and after reducing by force, or treaty, the towns of inferior note in the midland provinces of Italy, Totila proceeded, A. D. 546, to encompass Rome, and to starve its inhabitants. Famine had relaxed the strength and discipline of the garrison, and Rome was taken by the Goths in December, A. D. 546. After the departure of Totila, it was recovered by Belisarius in February, A. D. 547. (See BELISARIUS.) When Totila returned to avenge the injury and disgrace, the Goths were thrice repulsed; they lost the flower of their troops; the royal standard had almost fallen into the hands of the enemy, and the fame of Totila sunk, as it had risen, with the fortune of his arms. Rome was again taken by the Goths, A. D. 549. Justinian made great preparations for the Gothic war, the conduct of which was committed to Narfes, who defeated Totila in a bloody engagement, July, A. D. 552, and Totila himself was struck through the body with a lance. Narfes then proceeded to the conquest of Rome; and Justinian once more received the keys of the imperial city, which, under his reign, had been five times taken and recovered. The last king of the Goths was Teias, who was unanimously chosen to succeed and revenge their departed hero, March, A. D. 553. Sixty days were consumed in distant and fruitless combats, between the Gothic and Roman armies, but at length, after an engagement of many hours, Teias fell, and his head, exalted on a spear, proclaimed to the nations, that the Gothic kingdom was no more. After a reign of 60 years, the throne of the Gothic kings was filled by the exarchs of Ravenna (see EXARCH); and the remains of the Gothic nation evacuated the country or mingled with the people. (Anc. Un. Hist. vol. xvii. Gibbon's Hist. vol. vii. passim.)

The Goths spread themselves very widely in their various migrations, and formed part of the population of the several nations of Europe. In England the Celtic population was succeeded by the Gothic, and about two-thirds of England were possessed by the Belgic Goths. (See BELGIC and ENGLAND.) About the time that the Belgic seized on the south of England, it appears that a hundred Gothic tribes passed to the south of Ireland. (See IRELAND.) In France, or Gaul, the Goths, or warlike German tribes, under the denomination of Belge, seized on a third part of the country into which they introduced the Gothic language and manners. (See BELGIC and GAUL.) The original population of the Netherlands was Celtic; but it was afterwards supplanted by the Belge. (See BELGIC and NETHERLANDS.) In Germany, the Scythians or Goths, proceeding either from Scandinavia, or, as others say, from their original seats on the Euxine, expelled the Cimbric and Fins, and these, intermingled with the German nations, destroyed the Roman

empire in the west. (See GERMANY, and the preceding part of this article.) Prussia appears to have been peopled by the Peucini and Æthii, Gothic tribes bordering on the Venedi, who were Slavonians. (See PRUSSIA.) The Vandals, who conquered Spain in the fifth century, were subdued by the Visigoths under Euric, who founded the modern kingdom of Spain. (See SPAIN.) The original population of Turkey in Europe chiefly sprung from the ancient Scythians on the Euxine, the progenitors of the Dacians, Thracians, &c. and even of the Greeks. The regions of Turkey in Asia were peopled by Scythic nations, intermixed with a few Assyrians from the south. (See TURKEY.) The Batavi of Holland were the most northern people of Belgic Gaul, and without doubt a German or Gothic progeny. (See BATAVI, GAUL and HOLLAND.) The Cimbric or northern Celts, who originally peopled Denmark, were expelled by the Goths, if they were not, as some conceive, tribes of the same nation; and the Fins or Laps of Norway, which, with Sweden, constitutes the ancient Scandinavia, were driven to the northern extremities by the Gothic invasion. (See DENMARK, NORWAY, SCANDINAVIA, and SWEDEN.) The Helvetians, or original Swifs, are supposed by some writers to have been Celts; but others, with greater probability, consider them as a Gothic race, or very ancient colony of Germans.

It has been a general opinion, strenuously maintained by Cluverius and Pelloutier, and adopted by Mallet in his "Northern Antiquities," that the Gothic and Celtic nations were the same; but the ingenious English translator of Mr. Mallet's "Northern Antiquities" has produced a variety of testimonies from ancient authors, to prove that the Celtic and Teutonic or Gothic nations were, *ab origine*, distinct, and that they differed considerably in person, manners, laws, religion, and language. The former were the ancestors of the Gauls, Britons, and Irish; and the Germans, Saxons, and Scandinavians derived their origin from the latter. The Celtic tribes were probably the first that travelled westward; and the Goths, or Getae of the ancients, who emigrated at different times from the eastern countries after them, might borrow some of their opinions and practices, which will account for the resemblance that has been observed between them, without admitting that they were descended from them, or that they should be considered as the same people. In the same way we may account for those relics both of Celtic and Gothic superstitions, which are discernible in Gaul and Britain, and many other countries, the inhabitants of which derive their descent equally from the Celts and Goths, who were at different times masters of these kingdoms, and whose descendants are now blended together; thus, the first inhabitants of Gaul and Britain being of Celtic race, followed the Druidical superstition. The ancient Germans, Scandinavians, &c. being of Gothic race, professed that system of polytheism which was afterwards delivered in the Edda; and the Franks and Saxons, who afterwards settled in Gaul and Britain, being of Gothic race, introduced the polytheism of their own nation, which was in general the same that prevailed among all the other Gothic or Teutonic people. See, however, the article *GOTHIC language*, where the original identity of the Celts and Goths is maintained partly by general reasoning, and partly by etymological investigation.

GOTLUNDA, in *Geography*, a town of Sweden, in Nericia; nine miles N. N. E. of Orebro.

GOTOMB, a town of Poland, in the palatinate of Lublia; 28 miles N. W. of Lublin.

GO-TON, a town of China, in the province of Se-tchuen; 48 miles N. W. of Ou-mong.

GOTSEELA, a town of Bengal; 48 miles W. of Midnapour.

GOTTA, or GOTTO *Ilands*, a cluster of small Japanese islands. N. lat.  $30^{\circ} 40'$ . E. long.  $131^{\circ} 40'$ .

GOTTAUL, a town of Bengal; 33 miles S. of Burdwar. N. lat.  $22^{\circ} 42'$ . E. long.  $88^{\circ} 5'$ .

GOTTESBERG, a town of Silesia, in the principality of Schweidnitz, near which are two mines, one of gold, not now worked, and another of coals. The manufacture of this town consists of knit worsted stockings. It contains two churches; 12 miles S. W. of Schweidnitz. N. lat.  $50^{\circ} 35'$ . E. long.  $15^{\circ} 54'$ .

GOTTESGAB, a town of Bohemia, in the circle of Sautz. N. lat.  $30^{\circ} 22'$ . E. long.  $12^{\circ} 54'$ .

GOTTI, VINCENT-LEWIS, in *Biography*, was born at Bologna in the year 1664. At sixteen years of age he embraced the ecclesiastical life among the Dominican monks, and when he had completed his course of philosophy at Bologna, he was sent to study theology for four years at Salamanca in Spain. Upon his return to Italy in 1688, he was appointed professor of philosophy in the university of Bologna; and soon recommended himself by his talents and virtues to the posts of prior and provincial of his order. In 1728, pope Benedict XIII. raised him to the dignity of the purple; and three years afterwards appointed him member of the congregation for examining bishops. So highly was he esteemed, that in the last conclave, which was held during his time, he had the suffrages of a great number of the college for his being raised to the papal throne. He died at Rome in 1742, in his 79th year. His works, which are much valued by the Catholics, particularly by those in Italy, display considerable erudition and abilities. Of these the principal are "De vera Christi Ecclesia," in three volumes; "Theologia Scholastico-dogmatica, juxta Mentem divi Thomae Aquinatis, &c." in six volumes, 4to.; "Colloquia Theologica-polemica, in tres classes distributa, &c." 4to.; "De Eligenda inter Diffidentes Christianos Sententia," written in answer to a piece with the same title, by the celebrated John le Clerc; and an elaborate work in defence of the truth of the Christian religion against Atheists, Idolaters, Mahometans, Jews, &c. in 12 volumes. He was employed at the time of his death in writing "A Commentary on the book of Genesis." Moreri

GOTTIGNIES, GILES-FRANCIS, was born at Brussels in the year 1630, and entered into the order of the Jesuits at Mechlin in 1653, whence he was sent to Rome, to pursue his theological studies; here he spent the rest of his life employed in teaching the mathematics, and writing different works in that science. He died in 1689, when he was about sixty years of age. He was a considerable mathematician: a great lover of pure geometry, and had a distaste to the algebraic method of resolving problems; his works are very numerous, and have been highly commended for perspicuity and precision. They relate to arithmetic and geometry; to the various parts of astronomy, and other branches of speculative and practical mathematics. Moreri.

GOTTINGEN, or GOETTINGEN, in *Geography*, a town of the kingdom of Westphalia, and principal place of a district, named from it, is situated in a spacious, pleasant, fertile valley, on a canal, branching from the river Leine, and dividing the town into the New town and Marfeld. The number of houses is about 1000, containing about 8000 persons; the streets are large and paved; it has five parish churches, and one for Calvinists; the Roman Catholics perform their religious service in a private house. The town is governed by a provost, named by the sovereign, burgo-masters, and a synod chosen by the regency, assisted by a council. The university of Göttingen claims peculiar notice; it was founded

in 1734 by George II, king of England, and consecrated on the 17th of September 1737, and by the attention of its first curator, baron Munchausen, it has risen to distinguished reputation. It has a splendid church, with its own pastor; and it is accommodated with a stately edifice of 1000, the ground-floor of which serves as a hall for public lectures, and the upper apartments are appropriated to the library, council-chamber, and other necessary purposes. Its library is very large and valuable, and it is called the "Bulowiana," from a collection of about 10,000 volumes, with which it originated, bequeathed by baron Bulow for public use, and granted by his heirs to the university. A royal society of sciences, founded in 1751, and a royal German society, form part of the university. It has likewise a fine observatory, erected on a tower on the ramparts, with a physic garden, anatomical theatre, &c. The territory belonging to the town is very considerable; 22 miles N. E. of Cassel. N. lat.  $51^{\circ} 31'$ . E. long.  $9^{\circ} 52'$ .

GOTTO, a country of Africa, situated to the south of Jimbali and Tombuctoo, and the river Niger or Soliba, about  $15^{\circ}$  N. lat., and from  $0$  to  $2^{\circ}$  E. long. It was formerly divided into several petty states, under their own chiefs, but it is now under the government of a king. Its chief town is called Mooffeeddoo, from the name of their first monarch.

GOTTOLENGO, a town of Italy, in the department of the Mela; 15 miles S. of Brescia.

GOTTORP. See SLESWIC.

GOTTSCHÉE, a town of Middle Carniola; 20 miles S. S. E. of Ljubach. N. lat.  $45^{\circ} 53'$ . E. long.  $14^{\circ} 48'$ .

GOTZEL, a town of Bavaria; 36 miles E. of Ratibon.

GOVAN, a town of Scotland, in Lanarkshire; the population of which, in 1801, was 6701, of which 1314 were employed in trade and manufactures; four miles W. of Glasgow.

GOVANDORE, a bay on the coast of Chili.

GOVANIA, in *Botany*, was named by Jacquin in honour of Anthony Govan, a physician and celebrated botanist of Montpellier, where he has long filled the botanical chair, and, as far as we know, is still living, though at a very advanced age. He was the friend and correspondent of Linnæus, and is the author of a *Flora Montpeliana*, arranged according to what he himself calls a hybrid system, the outlines being on the principles of Tournefort, the subordinate sections taken from the Linnæan sexual system. This work appeared in 1765. He had previously, in 1762, published a *Hortus Montpelienfis* according to the last-mentioned system. Each work forms an octavo volume. They are chiefly remarkable for the secondary generic characters, taken from the habit, subjoined to the essential ones which are founded on the fructification. Professor Govan published also a folio volume of *Observationes Botanicae*, with plates illustrative of the plants of his neighbourhood; as well as a quarto in Latin and French on the methodical arrangement, and generic characters at length, of fishes.—*Acc.* Amer. 263. Linn. Gen. 547. Schreb. 53. Mart. Mill. Dict. v. 2. Jul. 381. Lamarck. Illust. t. 845.—Class and order, *Polygamia Monœcia*, or rather *Pentandria Aecogynia*. Nat. Ord. *Dumf.* Linn. *Rhamni*, Jun.

Gen. Ch. Cal. Perianth of one leaf, tubular, funnel-shaped, five-lobed; tube permanent; segments of the lobes ovate, acute, spreading, deciduous. Cor. Petals 5, opposite to the stamens, hood-shaped, elastic. Stamens 5, five, awl-shaped, the length of the segments of the calyx, and alternate with them, inserted into the tubular anthers roundish, incumbent, sheltered by the perianth. Pist. Germen inferior, roundish; style awl-shaped, divided into five

down into three segments; stigmas obtuse. *Peric.* Capsule with three angles, separable into three parts, of one cell each, not bursting. *Seeds* solitary, ovate, compressed, polished.—There are some male flowers, furnished with a style, but destitute of germen and stigma.

*Eff. Ch.* Calyx five-cleft. Petals five, hooded, covering the anthers. Style three-cleft. Capsule inferior, separating into three single-seeded parts.—Some flowers male.

Jacquin originally described two species, of which Linnæus adopted but one. Lamarek has added three more, all in our possession, to which we are enabled to furnish three non-descript species, making eight in all.

1. *G. domingensis*. Linn. Sp. Pl. 1663. Lamarek Dict. v. 3, 4. (*G. glabra*; Jacq. Amer. 264. t. 179. f. 40. *Lupulus sylvestris americana*, &c. Pluk. t. 201. f. 4.)—Leaves ovate, pointed, ferrated, nearly smooth. Wings of the fruit dilated, kidney-shaped.—Native of woods in Hispaniola and the Bahama islands. A climbing much branched *shrub*, the young branches downy, ending in long simple spiral tendrils. *Leaves* alternate, on short hairy stalks, ovate, a little unequal, an inch and half long, bluntly ferrated, furnished with a blunt entire point, and with several straight parallel veins directed forward. The young leaves are rather downy, old ones nearly smooth. *Stipules* small, half arrow-shaped. *Flowers* in long terminal clusters, small, greenish and unornamental. *Capsules* of a light spongy texture, their central part as big as a small pea, the wings thrice as long, spreading, pale brown, smooth and somewhat polished. *Seeds* hard, of a shining brown.

2. *G. tomentosa* Jacq. Amer. 263; Linn MSS in Sp. Pl. (*G. crenata*; Lamarek Dict. v. 3, 5?)—"Leaves ovate, crenate, downy."—Native of woods in Hispaniola, climbing to the tops of lofty trees. *Jacquin*. Of this we have seen no specimen. *Jacquin* says the *leaves* are four inches long. *Seeds* black and shining. Lamarek supposes his plant to be the same on account of the great size of its leaves, and he says it is distinguished from all others by their crenatures. *Jacquin* describes his as slightly crenate.

3. *G. cyclocarpa*.—Leaves elliptic-oblong, pointed, obscurely ferrated, roughish, naked on both sides. Wings of the fruit narrow, orbicular.—Native, we believe, of the West Indies. The very young *shoots* and *leaves* only are silky and ferruginous. The full-grown *leaves* are near three inches long and one broad, somewhat ovate, either almost entire, or furnished with shallow distant ferratures, and a short entire blunt point; they are green and quite naked on both sides, but harsh to the touch on the upper surface. Veins distant. *Footstalks*, *flowerstalks*, and *stipules* hairy. *Flowers* somewhat silky. *Fruit* orbicular at each side, each wing forming a hemisphere, and not being much dilated.

4. *G. denticulata*.—Leaves ovate, pale and downy beneath, entire, with a finely-toothed point.—Gathered by the late Mr. Christopher Smith in the island of Honimoo, East Indies.—The *leaves* are about an inch and half long, with straight veins, connected by numerous minute reticulations, and are remarkable for the numerous little sharp teeth which border their upper part and terminal point, while the rest of their margin is entire. Their upper side is roughish to the touch, but green and naked; while the lower is hoary with very dense short down, the veins only being naked. *Stipules* small and deciduous. A simple curled *tendril* terminates each lateral branch, as in all the foregoing. *Flowers* in axillary downy clusters, with lanceolate deciduous bractæas. The *fruit* we have not seen.

5. *G. mauritiana*. Lamarek Dict. v. 35.—Leaves ovate, pointed, variously ferrated, downy on both sides.—Native of the heights called the *Gol*, in the desert, of the ile de

Bourbon, where it was gathered by Commerfon, and sent to the botanic garden at Paris. The *leaves* are the size of the last, but green and clothed with silky down on both sides. Their figure is ovate, rarely somewhat cordate, often unequal, sharp-pointed, their margin singularly variable, being sometimes nearly entire, having only scattered shallow ferratures, sometimes very deeply and doubly ferrated, not unlike the Roman nettle, *Urtica filifera*. *Stipules* ovate, acute, clothed with shining reddish silky hairs, as well as the young twigs and tendrils. The *fructification* is wanting in our specimens. Lamarek says the *capsules* have rounded thin and membranous wings.

6. *G. tilifolia*. Lamarek Dict. v. 3, 5. (*G. Stadtmani*; Willem. Herb. Maurit. 58?)—Leaves heart-shaped, bluntly pointed, smooth on both sides, bluntly and slightly ferrated. Native of the ile de Bourbon, near *la Villeneuve*. Commerfon. The *stem* is much branched and divaricated, smooth, except the very young shoots. *Leaves* an inch or inch and half long, and nearly as broad, heart-shaped, with shallow ferratures and a short blunt point. They are light green and naked on both sides, smooth above; minutely chagrined beneath. *Stipules* glandular. *Flower-stalks* rusty and downy. The *tendrils* become very thick and strong by age.

7. *G. integrifolia*. Lamarek Dict. v. 3, 5.—Leaves ovate, bluntish, entire, smooth on both sides. *Stipules* awl-shaped. Long cultivated in the Paris garden, but its native country is not remembered. We have a specimen from thence, destitute of *flowers* and *fruit*, yet we readily agree with Lamarek that there can be no doubt respecting its genus. The habit, stem, tendrils, folded young leaves, and their pale parallel veins, all indicate a *Gouania*, for no genus can be more natural than this. The *leaves* are usually about an inch long, exactly ovate, (not oval) without any elongated point, though tipped with a gland; their margin quite entire, their midrib sometimes slightly hairy at the back. *Stipules* awl-shaped, deciduous. *Footstalks* hairy only while young.

8. *G. smilacina*.—Leaves heart-shaped, minutely ferrated, acute, somewhat hairy. *Stipules* awl-shaped. *Flower-stalks* umbellated, scarcely so long as the leaves. Brought by the late Sir G. L. Staunton, Bart. we believe from the Brasils. The zig-zag *branches*, with small heart-shaped *leaves*, and numerous axillary umbels of *flowers*, give it the aspect of a *Smilax*. The *tendrils* grow from the first joint of each branch, and are elegantly spiral; rusty and hairy, like the *flower-stalks* and *calyx*. The principal *leaves* are usually about an inch long, green on both sides, their ribs and veins always very hairy, their surface more or less so. *Stipules* awl-shaped, hairy. S.

GOUAREC, in *Geography*, a town of France, in the department of the North Coasts, and chief place of a canton, in the district of Loudeac; 24 miles S.W. of St. Brieuc. The place contains 678, and the canton 6,993 inhabitants, on a territory of 207½ kilometres, in 5 communes.

GOUD, or GAUD. See WELD.

GOUDA, or TERGOEW, in *Geography*, a city of Holland, seated on a branch of the Rhine, called Hiel, where it receives the Gouw, from which it derives its name. The great church of this town is one of the largest and handsomest in the country, and is particularly famous for its painted glass windows, which were executed principally by Theodore and Walter Crabeth of this town, and which are carefully preserved. The town is advantageously situated, on account of the sluices and canals, which are running streams, and its convenient port on the Hiel. It has five gates, and is so circumstanced by reason of the sluices, which may inundate the adjacent country, the breadth and depth of its ditches,



and the strong fortifications on the banks of the Ifsel, that it cannot easily be besieged. Its chief trade consists in cordage, cheese, and tobacco-pipes; and it has a regular communication by boats with Amsterdam, the Hague, Rotterdam, Utrecht, &c; 22 miles S. of Amsterdam. N. lat. 52° 1'. E. long. 4 36.

GOUDHURST, a post-town of England, in the county of Kent, containing 1782 inhabitants; 11 miles S. of Maidstone, and 44 S.E. of London.

GOUDOZ, a town of Asiatic Turkey, in Natolia; 72 miles E.N.E. of Kiutaja.

GOUDIMEL, CLAUDE, in *Biography*, one of the early and most celebrated composers of music to the metrical French translations of the psalms for the use of the Calvinists. He was a native of Franche-Comté, who seems to have lost his life at Lyons, on the day of the massacre of Paris, for having set to music the psalms of Clement Marot. Goudimel has been much celebrated by the Calvinists in France for this music, which was never used in the church of Geneva, and by the Catholics in Italy for instructing Palestrina in the art of composition, though it is doubtful whether this great harmonist and Goudimel had ever the least acquaintance or intercourse together. He set the "Chançons Spirituelles" of the celebrated Marc-Ant. De Muret, in four parts, which were printed at Paris, 1555. We may suppose Goudimel, at this time, to have been a Catholic, as the learned Muret is never ranked among heretics by French biographers. Ten years after, when he set the psalms of Clement Marot, this version was still regarded with less horror by the Catholics than in later times; for the music which Goudimel had set to it was printed at Paris by Adrian Le Roy, and Robert Ballard, with a privilege, 1565. It was reprinted in Holland, in 1607, for the use of the Calvinists, but seems to have been too difficult; for we are told by the editor of the psalms of Claude Le Jeune, which were printed at Leyden, 1633, and dedicated to the States-General, that, "in publishing the psalms in parts, he had preferred the music of Claude Le Jeune to that of Goudimel; for as the counterpoint was simply note for note, the most ignorant in music, if possessed of a voice, and acquainted with the psalm-tune, might join in the performance of any one of them; which is impracticable in the compositions of Goudimel, many of whose psalms being composed in fugue, can only be performed by persons well skilled in music.

The works of Goudimel, who was certainly the greatest musician in France, during the reign of Charles IX., are become so scarce, that his name and reputation are preserved by Protestant historians, more in pity of his misfortunes, than by any knowledge of their excellence. With respect to his having been the master of Palestrina, that point will be discussed elsewhere.

The earliest mention of Goudimel, as a composer, that we have been able to discover, is in a work entitled "Liber quartus Ecclesiasticarum Cantionum quatuor vocum vulgo Motetæ vocant," printed at Antwerp, by Susato, 1554, eighteen years before his death. On scoring several of these motets, we found the harmony pure and correct, but constructed entirely on the principles of the ecclesiastical tones; probably before he became a disciple of Calvin. The title of all his compositions may be seen in Draudius, *Bibl. Classicæ* and *Bibl. Exot.* (See FRANC, CLAUDE LE JEUNE, and PALESTRINA.) The motets of Goudimel, in four parts, resemble in gravity of style, simplicity in the subjects of fugue, and purity of harmony, the ecclesiastical compositions of our venerable countryman Bird.

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GOODSWAARTE, in *Geography*, a small island at the mouth of the Meuse, S. of the island of Putten.

GOUEGA, a town of Africa, in Whidah; 10 miles W.S.W. of Saba.

GOVENDING, a town of Bengal; 32 miles E. of Calcutta.

GOVERDAN, a town of Hindoostan, in Malva; 15 miles E.S.E. of Dig.—Also, a town in Oude, near the Dewah; 20 miles N. of Azangur.

GOVERDUNPOUR, a town of Hindoostan; 44 miles N. of Allahabad.

GOVERNUNGURRY, a town of Hindoostan, in Canara; 14 miles S.E. of Onore.

GOVERNMENT, a quality or office which gives a man power or right to command or rule over a place, a city, a province, a kingdom, or the like, either supremely or by deputation.

Government is either *general* and *supreme*, as that of a whole kingdom, empire, sovereign state, &c. or *particular* and *subordinate*; which, again, is subdivided into *civil*, *military*, and *ecclesiastical*.

Our cities, corporations, and boroughs, are usually governed by mayors, with aldermen and common-councilmen.

GOVERNMENT is also used for the country, city, or place to which the power of governing or commanding is extended.

GOVERNMENT, again, is used for the manner or form of governing, *i. e.* for the police of a country, state, &c.

In this sense the various forms of government have generally received their denominations from the number of persons to whom the supreme power has been entrusted. If it be in one person, it is called a *monarchy*, especially if the chief magistrate lies under considerable restrictions, or governs by fixed and established laws; whereas, if this single person lie under fewer restraints, or directs every thing by his own will and caprice, the government is called *despotic*. If the supreme power be lodged in a limited number of persons, the government is called an *oligarchy*, or *aristocracy*; and if all the citizens have an equal vote in making laws, and appointing magistrates, or the supreme power is lodged in the whole body of the people, it is called a *democracy* or *republic*. See these several articles.

Civil government and society originate in the wants and fears of individuals, who, being naturally free, equal, and independent, associate together, either by express or tacit consent, for the mutual preservation of their lives, liberties, and estates, on this fundamental principle, that the whole should protect all its parts, and that every part should pay obedience to the will of the whole. However the several forms of government, that now subsist, actually begun, there is and must be in all of them a supreme, irresistible, absolute, uncontrouled authority, in which the *jura summi imperii*, or the rights of sovereignty, reside; and this authority is placed in those hands, wherein, according to the opinion of the founders of such respective states, either expressly given, or collected from their tacit approbation, the qualities requisite for supremacy, *viz.* wisdom, goodness, and power, are the most likely to be found.

Individuals unite for mutual protection and benefit; and, therefore, the legislative and executive authority of government, originally derived from themselves, should be invariably directed to no other end but their safety and welfare; and that form of government is most eligible, which is best adapted to these purposes. Cicero declares himself of opinion, in his fragments *De Rep. lib. ii.* "esse optimum con-

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titutam reipublicam, quæ ex tribus generibus illis, regali, optimo et populari, sit modice confusa.' Of this kind is the British constitution, which lodges the executive power of the laws in a single person, and the legislative in three distinct powers, entirely independent of each other; *viz.* the king; the lords spiritual and temporal, forming an aristocratical assembly; and the house of commons, freely chosen by the people, which renders it a kind of democracy; and each branch of this aggregate body, actuated by different views, and attentive to different interests, is armed with a negative power, sufficient to repel any innovation which it shall think inexpedient or dangerous. Nothing can endanger or hurt the constitutional government of Britain, but destroying the equilibrium of power between one branch of the legislature and the rest: for if ever it should happen that the independence of any one of the three should be lost, or that it should become subservient to the views of the other two, there would soon be an end of our constitution: the legislature would be changed from that which was originally set up by the general consent and fundamental act of the society; and such a change, however effected, is, according to Mr. Locke, at once an entire dissolution of the bands of government, and the people are thereby reduced to a state of anarchy, with liberty to constitute to themselves a new legislative power. Locke on Government, book ii. chap. 19. Blackst. Com. vol. i. Introd.

Another excellent writer gives a different account of the origin of civil government from that which has been above stated. Accordingly, he observes, that government, at first, was either patriarchal or military; *that* of a parent over his family, or of a commander over his fellow-warriors. Paternal authority, and the order of domestic life, says Dr. Paley, (*Moral Philosophy*, vol. ii.) supplied the foundation of civil government. The condition of human infancy prepares men for society, by combining individuals into small communities, and by placing them from the beginning under direction and controul. A family contains the rudiments of an empire. The authority of one over many, and the disposition to govern and to be governed, are in this way incidental to the very nature, and coeval, no doubt, with the existence, of the human species. Besides, a parent would retain a considerable part of his authority after his children were grown up, and had formed families of their own. This is the second stage in the progress of dominion. The first was that of a parent over his young children; this that of an ancestor presiding over his adult descendants. The association, thus formed, would naturally be continued after the death of the original progenitor; and the members of it, accustomed to the benefits resulting from it, might be induced to supply his place by a formal choice of a successor, or they might voluntarily, and almost imperceptibly, transfer their obedience to one of the family, which had claimed their respect and confidence, or, again, they might receive with due deference a successor, appointed by the first ancestor. Thus we have a tribe or clan, incorporated under one chief, and fulfilling the purposes of civil union, without any other or more regular convention, constitution, or form of government than what has now been described. Two or three of these clans would frequently, by marriage, conquest, mutual defence, common distress, or some other accidental circumstances, be united into a society of larger extent. Another source of personal authority, which might extend, or supersede, the patriarchal, is that which results from military arrangement. A popular and successful leader, in every action of aggression or defence, would gain a powerful and permanent influence among his followers. This advan-

tage, added to the authority of the patriarchal chief, or favoured by any previous distinction of ancestry, would enable the person who possessed it to acquire the almost absolute direction of the affairs of the community; more especially if he took care to associate to himself proper auxiliaries, and to gratify or remove those who opposed his pretensions.

The causes which have contributed to introduce hereditary dominion, are principally the influence of association, which communicates to the son a portion of the respect that was paid to the virtues or station of the father, the mutual jealousy of other competitors, the greater envy with which all behold the exaltation of an equal, than the continuance of an acknowledged superiority, and the number of adherents left by a reigning prince, who preserve their own importance, merely by supporting the succession of his children, and the apprehension of calamities that are incidental to contested elections. The ancient state of society in most countries, says our author, and the modern condition of some uncivilized parts of the world, exhibit that appearance, which this account of the original of civil government would lead us to expect. The earliest histories of Palestine, Greece, Italy, Gaul, and Britain, inform us that these countries were occupied by many small independent nations, resembling those which are now found among the savage inhabitants of North America, and upon the coast of Africa. This theory, it is added, affords a presumption, that the earliest governments were monarchies, because the government of families, and of armies, from which, according to the preceding statement, civil government derived its institution, and probably its form, is universally monarchical.

Our readers will observe that this theory is very different from sir Robert Filmer's patriarchal scheme, now, indeed, almost forgotten and scarcely deserving to be recorded; the refutation of which constitutes the first part of the admirable Locke's Treatise on Government. According to this scheme, all government is absolute monarchy, which the author founds on this previous principle, that no man is born free. The absolute sovereignty of Adam was the result of a divine appointment and donation, and this sovereignty has been regularly conveyed by a divine hereditary right to all succeeding monarchs. The notion, that kings reign by a *divine right*, independently of the designation of the people, and not accountable to them for the exercise of their power, absurd as it will now very generally be thought, was, however, for a long time not only admitted, but prevalent even in this country. It is strongly inculcated in the Homilies of our established church, and was strenuously maintained by several of its respectable divines. Dr. Tillotson, enlightened and excellent as he was in other respects, could not, in the middle part of his life, emancipate himself from the idea, that it was sinful to resist government, as is evident from his letter to lord Russell. That power originates with the people was condemned as an abominable tenet by the famous Oxford decree of 1683; but this is a topic on which it is needless to enlarge.

In the most popular forms of government, says Dr. Paley, the physical strength resides in the governed; and it therefore becomes an inquiry of considerable importance, among politicians, what motives induce the many to submit to the few. In the discussion of this question our author distributes the subjects of a state into three different classes, *viz.* 1. Those who obey from prejudice, or who are determined by an opinion of *right* in their governors, which opinion is founded upon *prescription*: this prescriptive title, in hereditary monarchies, is corroborated, and its influence considerably augmented, by an accession of religious sentiments, and by that

sacreducts

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facredness which men are apt to ascribe to the persons of princes. 2. Those who obey from reason, by a consideration of the necessity of some government or other, and of the certain mischief of civil commotions. 3. Those who obey from self-interest, and who are kept in order by a variety of considerations that immediately affect themselves.

Concerning the moral obligation of submission to civil government, those who adopt the principles of Mr. Locke, and many other political writers, allege a compact between the citizen and the state, as the ground of the relation between them; and this compact binding the parties, like private contracts, resolves the duty of submission into the universal obligation of fidelity in the performance of promises. This compact is either, 1. *Express*, on the part of the primitive founders of the state, who are supposed to have met together for the declared purpose of settling the terms of their political union, and a future constitution of government. The whole body is supposed to have unanimously consented to be bound by the resolutions of the majority; and that majority is supposed to have fixed certain fundamental regulations, and thus to have constituted, either in one person, or in an assembly, a *standing legislature*, to which, under these pre-established restrictions, the government of the state was thenceforward committed, and whose laws the several members of the convention were, by their first undertaking, thus personally engaged to obey.—This transaction is sometimes called the “*Social compact*,” and these supposed original regulations compose what are meant by the “*constitution*,” the “*fundamental laws of the constitution* ;” and form, on one side, the “*inherent indefeasible prerogative of the crown*,” and, on the other, the unalienable “*birth-right*” of the subject; *i. e.* a *tacit* or *implied* compact by all succeeding members of the state, who, by accepting its protection, consent to be bound by its laws. “*This account of the subject*,” says Dr. Paley, “*although specious, and patronized by names the most respectable, appears to labour under the following objections; that it is founded upon a supposition false in fact; and leading to dangerous consequences.*” No such social compact was ever really made, nor any such original convention of the people ever actually held, or could be held in any country, antecedent to the existence of civil government in that country. It is to suppose it possible to call savages out of caves and deserts, to deliberate and vote upon topics, which the experience, and studies, and refinements of civil life, alone suggest: therefore no government in the universe *began* from this original. At a *Revolution* some imitation of a social compact may have taken place. The establishment of the United States of North America bears the nearest resemblance of it. Should it be said, that the original compact is not proposed as a fact, but as a fiction, for the commodious explication of the mutual rights and duties of sovereigns and subjects; to this representation it may be replied, that the original compact, if it be not a fact, is nothing; it can confer no actual authority upon laws or magistrates, nor afford any foundation to rights, which are supposed to be real and existing. But in the books, and also in the apprehension of those who deduce our civil rights and obligations *à priori*, the original convention is appealed to, and treated of, as a reality.

Moreover, it is alleged, that the theory of government, which affirms the existence and the obligation of a social compact, leads to conclusions unfavourable to the improvement, and to the peace, of human society. Upon this theory it may be presumed that many points, called “*fundamentals*” of the constitution, were settled by a convention of the people, anterior to the establishment of the subsisting

legislature, and which the legislature has no right to alter, or interfere with. This circumstance affords a dangerous pretence for disputing the authority of the laws. Hence arose the doubt, which so much agitated the minds of men in the reign of Charles II., whether an act of parliament could of right alter or limit the succession of the crown. Besides, if it be by virtue of a compact that the subject owes obedience to civil government, he ought to abide by the power of government which he finds established, however absurd or inconvenient it may be. Moreover, every violation of the compact on the part of the governor releases the subject from his allegiance, and dissolves the government.

Dr. Paley, rejecting the intervention of a compact, as unfounded in its principle, and dangerous in the application, assigns for the only ground of the subject's obligation, “*the will of God as collected from expediency.*” Accordingly the author reasons in the following manner. It is the will of God that the happiness of human life be promoted; civil society conduces to that end; civil societies cannot be upheld, unless in each, the interest of the whole society be binding upon every part and member of it; and this step of the argument conducts us to the conclusion, namely, that so long as the interest of the whole society requires it, that is, so long as the established government cannot be resisted or changed without public inconvenience, it is the will of God (which *will* universally determines our duty) that the established government be obeyed; and no longer. This principle being admitted, the justice of every particular case of resistance is reduced to a computation of the quantity of the danger and grievance on the one side, and of the probability and expence of redressing it on the other. If it be asked, who shall judge of this? the answer is, “*Every man for himself.*” In contentions between the sovereign and the subject, the parties acknowledge no common arbitrator; and it would be absurd to refer the decision to *those* whose conduct has provoked the question, and whose own interest, authority, and fate, are immediately concerned in it. From the substitution of “*public expediency*” into the place of all implied compacts, promises, or conventions whatsoever, our author infers, 1. That it may be as much a duty at one time to resist government as to obey it, *viz.* when more advantage will in our opinion accrue to the community from resistance, than mischief. 2. That the lawfulness of resistance, or the lawfulness of a revolt, does not depend alone upon the grievance which is sustained or found, but also upon the probable expence and event of the contest. Hence those who concerted the revolution in England were justifiable in their counsels. 3. That irregularity in the first foundation of a state, or subsequent violence, fraud, or injustice in getting possession of the supreme power, are not sufficient reasons for resistance, after the government is once peaceably settled. 4. That resistance is not justified by every invasion of the subject's rights, or liberty, or of the constitution; by every breach of promise, or of oath; by every stretch of prerogative, abuse of power, or neglect of duty on the part of the chief magistrate; unless these crimes draw after them public consequences of sufficient magnitude to outweigh the evils of civil disturbance. 5. That no usage, law, or authority whatever, is so binding, that it need or ought to be continued, when it may be changed with advantage to the community. 6. As all civil obligation is resolved into expediency, what, it may be asked, is the difference between the obligation of an Englishman and a Frenchman, or why is a Frenchman bound in conscience to bear any thing from his king, which an Englishman would

not be bound to bear, since the obligation of both is founded in the same reason? Although their conditions may differ, their *rights* should seem to be equal; and yet we are accustomed to speak of the rights as well as the happiness of a free people, compared with what belong to the subjects of absolute monarchies; and how, it may be reasonably inquired, can this comparison be explained, unless we refer to a difference in the compacts by which they are respectively bound? In order to obviate this difficulty, it is allowed that a Frenchman is in conscience bound to endure many things from his prince, to which an Englishman would not be bound to submit for the following reasons; *viz.* because the same act of the prince is not the same grievance where it is agreeable to the constitution, and where it infringes it; and because redress in the two cases is not equally attainable. The duty of obedience is defined by different boundaries, and the point of justifiable resistance is placed at different parts of the *scale* of suffering—all which is sufficiently intelligible without a social compact. 7. The interest of the whole society is binding upon every part of it. If we appeal to the Christian scriptures with regard to the duty of civil obedience or the *extent* of our civil rights and obligations, Christianity hath left us where she found us; she has neither altered, nor ascertained it. The two passages to which writers have generally referred in their investigation of this subject are Romans xiii. 1—7, and 1 Peter ii. 13—18. In order to comprehend the proper import of the instructions contained in these passages, there are two questions relating to the subject of civil obedience, which should be considered, *viz.* whether to obey government be a moral duty and obligation upon the conscience at all, and how far, and to what cases, that obedience ought to extend? These passages, it may be observed, inculcate the *duty*; but they do not describe the *extent* of it. The due consideration of this distinction is sufficient to vindicate these passages of scripture from any explanation of them that shall favour an unlimited passive obedience. But admitting what many commentators have stated, that an opinion was privately cherished by the first Christians, which led them to conceive, that their conversion to Christianity entitled them to new immunities, to an exemption as of *right* (however they might give way to necessity) from the authority of the Roman sovereign, we are furnished with a still more apt and satisfactory interpretation of the Apostle's words. The two passages apply with great propriety to the refutation of this error. Little need be added in explanation of particular clauses. St. Paul has said, "whosoever resisteth the power, resisteth the ordinance of God." This phrase, "the ordinance of God," is by many so interpreted as to authorize the most exalted and superstitious ideas of the regal character. But surely such interpreters have sacrificed truth to adulation. For, in the first place, the expression, as used by St. Paul, is just as applicable to one kind of government, and to one kind of succession, as to another,—to the elective magistrates of a pure republic, as to an absolute hereditary monarch. In the next place, it is not affirmed of the supreme magistrate exclusively, that *he* is the ordinance of God; the title, whatever it imports, belongs to every inferior officer of the state as much as to the highest. The divine right of *kings* is, like the divine right of *constables*, in the law of the land, or even actual and quiet possession of their office; a right ratified, we humbly presume, by the divine approbation, so long as obedience to their authority appears to be necessary or conducive to the common welfare. Princes are ordained of God by virtue only of that general decree, by which he assents, and adds the

function of his will, to every law of society, which promotes his own purpose, the communication of human happiness: according to which idea of their origin and constitution, and without any repugnancy to the words of St. Paul, they are by St. Peter denominated the "*ordinance of man.*" Paley, *ubi supra*. See KING, LAW, LIBERTY, MONARCHY, PARLIAMENT, PASSIVE obedience, &c.

GOVERNMENT, in *Grammar*, is understood of that construction of nouns and verbs, wherein they require some alteration to be made in others joined or constructed with them.

Construction is divided into two parts; that of *concord*, and that of government, called also *regimen*. See CONCORD and REGIMEN.

GOVERNOLIO, in *Geography*, a town of Italy, in the department of the Mincio; 12 miles S. E. of Mantua.

GOVERNOR, an officer veiled by a king, or sovereign prince, with the command and administration of a province, place, &c.

A governor represents the king; and not only commands the garrison, troops, &c. but the citizens, &c. A governor of a fortified place was anciently required to hold out three attacks, before he surrendered.

GOVERNOR is also frequently used for a president or superintendent.

Thus we say, the governor of the bank; the governor and directors of the South Sea company; the governor of an hospital, &c.

GOVERY, in *Geography*, a town of Hindoostan, in the circle of Rajamundry; 10 miles W. N.W. of Rajamundry.

GOUF. See GOLF.

GOUFRE, in *Geography*, a town of Canada, in the river St. Lawrence; 50 miles E. of Quebec.

GOUGANE-BANRA, a lake of Ireland, in the county of Cork, not far from Inchigeel. The river Lee rises in a mountain above this lake, through which it flows. It was formerly the residence of St. Fin-Bar, and is visited by great numbers of pilgrims, whilst its romantic beauties attract a few travellers, notwithstanding the ruggedness of the road.

GOUGE, WILLIAM, in *Biography*, who flourished in the former part of the seventeenth century, was born in the parish of Bow, in the year 1575. He was educated partly at St. Paul's school, and partly at Eton, and, in 1595, he was elected to King's college, Cambridge. Here, in due time, he performed with much applause all the exercises required by the statutes, and took his degrees. In 1607, he was admitted into orders, and in the following year obtained the rectory of Blackfriars, London. In this situation he continued during the remainder of his life, discharging the pastoral functions with great diligence and fidelity, and setting before his parishioners an example worthy of imitation. The zeal with which he performed the duties of his office, led him to establish a weekly lecture, which was frequented not only by his own people but by many of the London clergy, the members of the Inns of Court, and the more respectable and serious citizens. In 1628, he was admitted to the degree of doctor of divinity, and about the same period he became one of the trustees of the society that had united for the purpose of buying up impropriations, to bestow them on such unpatronized clergymen as were distinguished for piety and other ministerial qualifications, which occasioned his being prosecuted in the star-chamber. In 1653, he was nominated one of the assembly of divines, and was held in such reputation by that body, that he was often called to fill the moderator's chair

during his absence. He was selected as a proper person to write notes on the bible, and took, for his share of the work, from the beginning of the first book of Kings to that of Job. He died in the year 1653, soon after he had completed his 78th year. He had, for several years, been esteemed the father of the London ministers. In his deportment, he was modest, humble, and affable; he had a pious and benevolent spirit, and continued to preach as long as he had strength to walk into the pulpit. Besides the "Annotations" already referred to, Dr. Gouge published many other theological pieces, as "A Commentary on the Epistle to the Hebrews;" "An Exposition of the Lord's Prayer;" "The whole Armour of God," &c.

GOUGE, THOMAS, son of the preceding, was born at Bow, in the year 1605; and having, in his academical course, followed the steps of his father, he was first chosen fellow of his college, and afterwards presented with a living at Colfden, near Croydon, in Surrey, where he continued but a short time; and, in 1638, he undertook the more important charge of St. Sepulchre's parish, London. During a period of twenty-four years he discharged the duties of his profession with the most exemplary zeal. Besides preaching twice every Sunday, and often on week days, he visited his flock, catechised their children, enquired into and relieved the wants of the poor, and devised plans for their employment. He is said to have given the hint which produced the humane and benevolent institutions of Mr. Firmin, which have been referred to in the memoir of that excellent citizen. When the act of Uniformity took place, he was too conscientious to sacrifice his principles on the shrine of power, and was ejected from his living. His time was now zealously devoted to acts of beneficence and charity. He employed his own fortune, which was considerable, in relieving the wants of his poorer brethren, who, on account of their non-conformity, were deprived of their means of subsistence; and he was a successful applicant to the rich, from whom he received large sums, which were applied to that humane purpose. In the year 1671, he set about a plan for introducing knowledge and religion into the different parts of Wales, which at that period were in the most deplorable darkness. He established schools in different towns where the poor were willing that their children should be taught the elements of learning, and he undertook to pay all the expences which were incurred in the outset of the business. By degrees these schools amounted to between three and four hundred, and they were all annually visited by Mr. Gouge, when he carefully enquired into the progress made by the young people, before whom he occasionally preached in a style adapted to their age and circumstances in life, until he was obliged to desist by prosecutions carried on against him in the ecclesiastical courts. With the assistance of his friends, whose purses were ever open at his command, he printed eight thousand copies of the bible in the Welsh language, a thousand of these were distributed freely among those who could not afford to purchase them, and the rest were sent to the cities and chief towns in the principality, to be sold at reasonable rates. He procured likewise the church catechism, and other practical pieces, to be printed in the Welsh language, and distributed among the poor. To these and such like charitable undertakings did Mr. Gouge devote his time, his talents, and his fortune, when precluded by the intolerance of the laws from officiating in the capacity of a preacher. He was accustomed to say with pleasure, "that he had two livings which he would not exchange for two of the greatest in England." These were Wales, where he travelled every year to diffuse the principles of

knowledge, piety, and charity: and Christ's Hospital, where he catechised and instructed the children in the fundamental principles of religion. He died suddenly in 1691, in the seventy-seventh year of his age. His death was regarded as a public loss. A funeral sermon was preached on the occasion by Dr. Tillotson, afterwards archbishop of Canterbury; who, at the conclusion of an animated eulogium on his piety and virtue, observes, that "all things considered, there have not, since the primitive times of Christianity, been many among the sons of men, to whom that glorious character of the son of God might be better applied, than "he went about doing good." And Mr. Baxter, in his Narrative of his own Life and Times, says of Mr. Gouge, "I never heard any one person, of whatever rank, sort, or sect soever, speak one word to his dishonour, or name any fault that they charged on his life or doctrine; no, not the prelatists themselves, save only that he conformed not to their impositions; and that he did so much good with so much industry." This eminent Christian divine published a few practical pieces, of which the following may be mentioned; "The Principles of Religion Explained;" "A Word to Sinners;" "Christian Directions to walk with God;" "The surest and safest Way of Thriving, viz. by Charity to the Poor;" "The Young Man's Guide through the Wilderness of this World." Gen. Biog. Neal's Hist. of the Puritans.

GOUGE, an instrument used by divers artificers; being a sort of round, hollow chisel; serving to cut holes, channels, grooves, &c. in wood, stone, &c.

GOUGEON, JOHN, in *Biography*, a French sculptor and architect in the reigns of Francis I. and his successors, is reckoned the first who introduced a true taste for sculpture in France, and freed it from the barbarism of former times. He was employed in many of the public works with which Paris began to be decorated in the reign of Francis I. Of these the most considerable is the fountain of the Nymphs, called the Innocents, finished in the year 1550. Among the other remains of his workmanship is a tribune in the hall des Cent-Suisses, at the Louvre, enriched with sculptures, and supported by four gigantic Caryatides. He was an able medalist, and struck several pieces for Catharine de Medicis, which are sought by the curious. He generally worked in small, and there are no detached figures or groups by his hand. His reliefs are executed with taste, his drapery is light and elegant, his figures graceful and flexible, but their attitudes somewhat forced. He was a Huguenot, and was shot as he was working on a scaffold, on the infamous St. Bartholomew's day, 1570. Gen. Biog.

GOUGH'S ISLAND, in *Geography*, a small island in the Southern Atlantic ocean, discovered by captain Gough in 1715. It is very high land, in S. lat. 40 15. W. long. 81° 57'. Some doubt being entertained with respect to its true longitude, it was recommended to M. de la Perouse to ascertain its true position, as it lies in the way of ships going directly to India, or China, early in the season, without touching at the Cape.

GOUJET, CLAUDE PETER, in *Biography*, was born at Paris in 1697. His father, a tailor by trade, in vain opposed his inclination for a studious life. He was educated among the Jesuits, and, having taken orders, became a canon of the church of St. Jacques de l'Hôpital in Paris. He was an associate of several academies in France, and was generally esteemed for his learning, and also on account of the mildness of his temper and the purity of his morals. He died in 1767, and had collected a library of ten thousand well chosen volumes, which was the basis of his numerous works. Of these, the following may be mentioned, "Vies des

des Saints," in two vols. 4to. "Supplement to Moreri's Dictionary," two vols. folio. "Bibliothèque des Ecrivains Ecclesiastiques," three vols. 8vo. "Discours sur le Renouveau des Etudes depuis le xiv<sup>e</sup> Siècle." "De l'Etat des Sciences en France depuis la Mort de Charlemagne jusqu'à celle du Roi Robert." This dissertation obtained for the author the prize of the Academy of Belles Lettres, and he was complimented by a deputation from that body, desiring permission to nominate him to the vacant place of the deceased abbé Vertot. Goujet was likewise author of "Bibliothèque Française, ou Histoire de la Littérature Française," 18 volumes 12mo. which is reckoned his most valuable work. Moreri.

GOUJIN, in *Geography*, a town of Portugal, in the province of Beira; 12 miles S.W. of St. Joao de Pefqueira.

GOVINPOUR, a town of Hindoostan, in Bahar; 26 miles S. of Bahar.—Also, a town of Bengal; 10 miles W. of Nuldingah.

GOULAMCONDA, a town of Hindoostan, in the Myfore; 9 miles S. of Gooty.

GOULART, SIMON, in *Biography*, a French Protestant divine, was born at Senlis in 1543. He began his studies late in life, but by persevering industry, he made a great proficiency in the learned languages, and was chosen pastor of the church of which Calvin had been minister. Here he discharged the duties of his office with much diligence and success, till within a few years of his death, which took place in 1628, when he was about 85 years of age. He edited many works, performing at the same time the business of a commentator. Among these were the "Works of Plutarch;" "St. Cyprian's Works;" "Seneca's Works," &c. He made a collection of "Remarkable Histories" in 2 vols. 8vo., and wrote several pieces relating to the history of his own times. The most interesting and curious of the latter description is his "Collection of the most memorable events which occurred during the League, with notes and original documents," in six vols. 4to. Many of his pieces were anonymous, but to these he usually affixed the initials S. G. S. signifying "Simon Goulart Senlisien." He had such an extensive acquaintance with the literature of his time, and knew so well to whom different publications, that were printed without the writer's name, were to be attributed, that Henry III. of France, being desirous of knowing who was the author of a piece published under the assumed name of Stephanus Junius Brutus, and intended to propagate republican doctrines, sent a person to Geneva to enquire into the matter of Goulart, but the latter refused to communicate the fact, for fear of exposing the author to serious injury. Moreri Bayle.

GOULDSBOROUGH HARBOUR, in *Geography*, a harbour of the United States of America, in the district of Main. N. lat. 44° 25'. W. long. 67° 53'.

GOULERGAUT, a town of Thibet; 28 miles S. of Deuprag.

GOULOUR, a town of Hindoostan, in the circar of Sanore; 18 miles N. of Sanore.

GOULSTON, THEODORE, in *Biography*, was the son of William, rector of Wymondham, and was born in Northamptonshire. He became probationer fellow of Merton college, Oxford, in 1596; and, after applying himself to the study of physic in this university, he practised for a time with considerable reputation at Wymondham and its neighbourhood. At length, after taking his doctor's degree in 1610, he removed to London, and became a fellow of the College of Physicians, and afterwards censor. He resided in the parish of St. Martin's, near Ludgate, and was in

great esteem, as well for classical learning and theology, as for the practice of his profession. He died in the year 1632; and by an article in his will testified such regard to the interests of medicine, as entitles him to grateful commemoration. This was a bequest of 200 pounds, to purchase a rent charge for the maintenance of an annual pathological lecture within the College of Physicians, to be read by one of the four youngest doctors of the College. The public has been indebted on several occasions to this institution for ingenious dissertations, delivered as Gullstonian Lectures; as those of Dr. Musgrave; Dr. Fordyce's Treatise on Digestion; &c.

Dr. Gullston published the following works. "Versio Latina et Paraphrasis in Aristotelis Rhetoricam." Lond. 1619, &c. "Aristotelis de Poetica Liber, Latine conversus et Analytica Methodo illustratus." Lond. 1623. And after his death, his intimate friend Thomas Gataker, B. D. published his "Versio, variaz Lectiones et Annotationes Criticæ in opuscula varia Galeni." Lond. 1640. Aikin, Biograph. Mem. of Med.

GOUMEL, in *Geography*, a town of Africa, and capital of the country of the Foulahs, and residence of the Siratik. N. lat. 16° 16'. W. long. 11° 32'.

GOUNDA, a town of Hindoostan, in Oude; 32 miles E.N.E. of Manickpour.

GOUPIA, in *Botany*. See GLOSSOPETALUM.

GOUPIL, JAMES, in *Biography*, a physician of the sixteenth century, was born in the province of Poitou. He acquired a considerable knowledge of the ancient languages, and afterwards directed his studies to medicine, in the schools of Paris, where he graduated in 1547. His talents attracted the attention of the court, and he was appointed by Henry II. to the professorship of medicine in the royal college, in 1555, a vacancy being occasioned by the death of Sylvius. He is principally known as an editor and annotator of the writings of Dioscorides, Alexander Trallian, Aëturius, and some other Greek writers: and he was engaged in the same labour, in respect to some of the writings of Hippocrates, when his studies were terminated by death, in 1568. Eloy.

GOUR, called also *Lucknoui*, in *Geography*, the ancient capital of Bengal, supposed to be the "Gangia Regia" of Ptolemy, which stood on the left bank of the Ganges, about 25 miles below Rajemul. N. lat. 24° 53'. E. long. 88° 14'. It was the capital of Bengal 730 years B. C. and was repaired and beautified by Achar, A. D. 1575, who gave it the name of "Jennuteabad," which name part of the circar in which it was situated still bears. It was deserted, as it is said, on account of the insalubrity of its air. Taking the extent of the ruins of Gour at the most reasonable calculation, it is not less than 15 miles in length, along the old bank of the Ganges, and from two to three in breadth. Several villages stand on part of its site; the remainder is either covered with thick forests, the habitations of tygers and other beasts of prey, or become arable land, whose soil is chiefly composed of brick-dust. The principal ruins are a mosque lined with black marble, elaborately wrought; and two gates of the citadel, which are grand and lofty. The bricks, which continue to be an article of merchandize, are of a peculiarly solid and durable texture.

GOURA, or GURA, a town of the duchy of Warfaw, on the Viitula; 12 miles from Warfaw.

GOVRA, a town of Persia, in the province of Irak; 35 miles E. of Isfahan.

GOURAY, a cape on the E. coast of the island of Jersey; 4 miles E. of St. Helier.—Also, a town of France,



in the department of the North Coasts; 8 miles S. of Lamballe.

GOURD, in *Botany*. See CUCURBITA.

GOURD, *Bitter*. See COLOCYNTHIS.

GOURD, *Indian tree*. See CRESCENTIA.

GOURD, *Sour*. See BAOBAB.

GOURD-worm, the English name of a species of worm found in the intestines of several animals. It has this name from its resembling the seed of the gourd in figure.

GOURDON, in *Geography*, a town of France, in the department of the Lot, and principal place of a district, 16 miles N. of Cahors. N. lat.  $46^{\circ} 44'$ . E. long.  $1^{\circ} 28'$ . The place contains 3703, and the canton 12,115 inhabitants, on a territory of 150 kilometres, in 15 communes.

GOURDY, *Legs of Horses*. See GREASE.

GOUREY, in *Geography*, a town of Hindoostan, in Oude; 10 miles N. W. of Lucknow.

GOURGONG, a town of Hindoostan, in Allahabad; 10 miles N. of Corah.

GOURGOUTY, a town of Hindoostan, in Golconda; 36 miles W. S. W. of Rachore.

GOURIN, a town of France, in the department of the Morbihan, and chief place of a canton, in the district of Pontivy; 26 miles W. N. W. of Pontivy. The place contains 3674, and the canton 11,819 inhabitants, on a territory of  $242\frac{1}{2}$  kilometres, in five communes.

GOURMA, a town of Abyssinia, on the coast of the Red sea. N. lat  $14^{\circ} 52'$ .

GOURMUNGUL, a town of Hindoostan, in Golconda; 12 miles S. W. of Malkar.

GOURMELEN, ETIENNE, in *Biography*, was a native of Brittany, and was sent at an early age to Paris, where he studied surgery, and afterwards medicine; in the latter of which he took the degree of doctor in the year 1559, and was elected dean of the faculty in November, 1574. Surgery, however, continued to be the favourite object of his attention, and he was appointed by Henry III. professor of surgery in the Royal College in the year 1588. But he did not long fill his chair, for he died in 1594. His writings, which were valuable in their day, have now lost their interest, in consequence of the great improvements of modern surgery: they consist of a "Synopsis Chirurgie," printed in 1566, and afterwards translated into French;—a Latin translation of Hippocrates "De Alimento," with a commentary;—and a treatise, entitled "Chirurgie Artis ex Hippocratis et Veterum decretis ad rationis normam redactæ, Libri tres," 1580. Eloy. Dict. Hist.

GOURNAI, LE JARS DE, MARY, was born at Paris in 1506. She was, while very young, deprived of her father, and acquired an adoptive one in the celebrated Michael Montagne, who became the object of her enthusiastic admiration. After the death of Montagne she became heiress of his writings, and published an edition of his "Essays," dedicated to cardinal Richelieu. She had well improved the lessons of youth, and was intimately acquainted with the learned languages. She maintained a correspondence with many of the most eminent literary characters of the age, by some of whom she was honoured with the title of the "Tenth Muse;" by others she was denominated the "French Syren;" it is not, however, improbable, that the uncommonness of female learning at that time in France, rather than the intrinsic merit of her writings, excited admiration. In her own language she wrote a stiff and awkward style, and her taste in reading was usually turned to the compilations and commentaries of past ages. She passed her life in celibacy, contented with a small pension from the court, and much

esteemed by her particular friends, some of whom were persons of high rank. She died at Paris in 1645, in her 79th year, and was honoured with many epitaphs from literary characters. Her works were collected in a quarto volume, under the title of "Les Avis ou les presens de M<sup>lle</sup> Demoiselle de Gournai." Her temper was apt to be violent, and she was very resentful of real or supposed injuries; by these means she made herself many enemies, who attacked her in their writings, in which neither her person, nor the defects in her character were spared. Bayle. Moreri.

GOURNAY, in *Geography*, a town of France, in the department of the Lower Seine, and chief place of a canton in the district of Neufchatel, 24 miles E. of Rouen. N. lat.  $49^{\circ} 29'$ . E. long.  $1^{\circ} 47'$ . The place contains 3545, and the canton 11,301 inhabitants, on a territory of 180 kilometres, in 19 communes.

GOURNEL, a town of Egypt, on the site of the ancient Thebes.

GOUROCK. See GREENOCK.

GOURRI, a town of Abyssinia; 35 miles S. W. of Assab.

GOURVILLE, JOHN HERVILDEE, in *Biography*, born at Rochefoucauld in 1625, was taken by the celebrated duke of that title into his service as valet de chambre, but in a short time he became his confidential friend. He was patronized by the great Condé, and was employed by the superintendent Fouquet, in public business. So well did he approve himself to his employers for political talents and integrity that he was proposed to the king as successor to Colbert in the ministry. He died in 1705, leaving behind him "Memoirs of his Life from 1642 to 1698," in two volumes 12mo. These memoirs are written with frankness and simplicity, in a lively, though incorrect style, and they contain many curious and well authenticated anecdotes of the ministers and principal persons of his time, of which, it is said, Voltaire made much use. Moreri.

GOURY PASHUM, in *Natural History*, a name given by the people of the East Indies to a kind of orpiment of a deep yellow colour, veined with red in several places, and in some with white. It is found principally at the bottoms of mountains. They calcine it several times, and afterwards give it internally after intermitting fevers, and use it externally in ointments for the itch.

GOUSSET, JAMES, in *Biography*, was born at Blois in the year 1635. He was educated for the ministry, and was chosen pastor of the Protestant church at Poitiers in the year 1662. He was thrice invited to undertake the professorship of divinity at Saumur, but refused to quit his flock till compelled to become a fugitive from the kingdom, in consequence of the revocation of the edict of Nantz. On this occasion he took refuge in Holland, and afterwards was settled, as French minister, at Groningen, where he likewise exercised the offices of professor of divinity, and of the Hebrew language in the university of that city. He died there in 1704, in his sixty-ninth year. His principal works were "Dissertationes in Controversiis with the Jews," 1699. "Commentarii Lingue Hebraicæ," 1702, which form a valuable Hebrew dictionary, of which the best edition was published at Leipzig in 1743. "Dissertationes in Epistolam Pauli ad Hebræos," &c. 1712. At his death he left behind him numerous MSS., among which are commentaries upon the whole of the sacred scriptures. Moreri.

GOUST, GOUT, a French term, for what the Italians call *gusto*, and we *taste*.

GOUT, in *Medicine*, a disease principally characterized by inflammatory attacks of the joints; more especially of the feet,

foot, which return at intervals, and are connected with derangement of the digestive organs. The term, however, includes such a variety of morbid affections, in its extended sense, that it is not easy to give a concise definition of it; and we must have recourse to a more ample description of those affections, in order to convey a just notion of its signification.

The ancient physicians included all the varieties of inflammation, that are liable to occur in the joints, under the general term, *Arthritis*, (from  $\alpha\rho\theta\rho\iota\sigma$ , a joint, with the termination *itis*, denoting inflammation,) for the distinctions, made by modern physicians, between the two modifications of inflammation in the joints, now denominated *gout* and *rheumatism*, had not then been attended to. The term *Arthritis*, however, was used both as a generic and specific term, and signified, not only inflammation of the joints generally, but the ordinary form of gout by way of excellence. But the Greeks also gave specific names to the varieties of arthritis, according to the particular joints which the disease occupied: thus, for the ordinary form of gout in the foot the term  $\rho\omicron\delta\alpha\gamma\rho\alpha$ , *podagra*, was employed, which also became a generic title; for gout in the hand, the word  $\chi\omicron\iota\sigma\alpha\rho\rho\alpha$ , *chiroagra*; and for gout in the knee,  $\gamma\omicron\nu\gamma\alpha\gamma\rho\alpha$ , *gonagra*; and so on. Among the species of arthritis was also included the *ischiatic*, *sciatica*, or *hip-gout*, which is now deemed a species of rheumatism. These terms the Romans adopted; and they are still retained in medical language. Our vernacular term *gout*, which came to us probably through the French, *la goutte*, originated in the dark ages among the humoral pathologists, who considered the disease as arising from the slow deposition of a morbid humour, *guttatum*, as it were, upon the joints; hence, the name *gutta*, or *drop*, was applied to the disease. This term, according to Du Cange, was used by Radulfus, a Dominican of the 13th century, who writes, "cum *gutta*, quam *podagram* vel *arthriticam* vocant, frequenter vexaretur." Musgrave de Arthritide.

In consequence of the various forms which gout assumes, physicians have divided it under two heads, *regular* and *irregular* gout, or, as some have termed it, *tonic* and *atonic* gout; the former occurring in the earlier periods of life, while the strength or tone of the system remains unbroken; the latter, after a certain degree of weakness, or atony of the constitution, has been produced by the frequent attacks of the disease, advanced age, or other causes. We shall first describe the symptoms by which these forms of the disease are characterized, and afterwards state the causes and method of treatment, together with the speculations of pathologists, respecting the nature of the disease, beginning with an account of the paroxysm of

*Regular Gout.*—It is an inflammatory affection of the joints of the foot, which constitutes what is called a fit or paroxysm of the regular gout. This sometimes comes on suddenly without any warning of its approach; but it is generally preceded by several symptoms, especially by those of indigestion, as heart-burn, flatulence, and heaviness after meals, with eructations of acid or bitter matters, and some degree of languor and torpor of the body; but immediately before the fit the appetite is sometimes unusually sharp. There is also often an unusual coldness of the feet and legs for a few days preceding the fit, with the cessation of the perspiration about the former; a frequent numbness, alternating with a sense of prickling, along the whole of the lower extremities; occasional cramps of the muscles of the legs; and an unusual turgescence of the veins, are occasionally observed.

The attack is sometimes felt in the evening, but more

commonly about two or three o'clock in the morning; when the patient is awakened from a quiet sleep by a pain affecting one foot, generally the ball or first joint of the great toe, but sometimes the other parts of the foot, or the ankle. This pain is accompanied with more or less of chilliness and shivering, which, as the pain increases, gradually cease, and are succeeded by a hot stage of pyrexia, or symptomatic fever, which continues during the same time as the pain. The pain becomes by degrees more and more violent; at first it is attended with a sensation, as if warm water were poured upon the membranes affected, and is said to resemble the pain of a dislocated joint; as it becomes severe it is sometimes described as resembling the pain of a tension, or laceration of the ligaments, sometimes as like that from the gnawing of a dog, and sometimes as a feeling of weight and constriction of the membranes of the part, which becomes so exquisitely tender, as not to endure the weight of the bed-clothes, nor even the shaking of the room from a person walking briskly in it. Hence, great restlessness of the whole body, and especially of the part affected, always accompanies the fit; the patient constantly changing his posture, with a view to ease the pain, which, nevertheless, continues severe all the following day, until mid-night, after which it gradually remits; and about two or three in the morning, that is, after twenty-four hours from the first attack, it commonly ceases almost entirely; and this freedom, with the breaking out of a free perspiration, allows the patient to fall asleep. On waking, he finds the pain slight, and the part affected with some redness and swelling.

When a paroxysm has thus come on, although the violent pain, after the period of twenty-four hours, be considerably diminished, yet the patient is not entirely without pain. For some days he has a return every evening of pain and fever, which continue, with more or less violence, till morning. After continuing in this manner for several days, the disease sometimes goes off entirely, not to return till after a long interval; and in such cases it generally leaves the person in very perfect health, enjoying greater ease and alacrity in the functions both of body and mind, than he had for a long time before experienced.

It often happens, however, that the disease does not thus speedily quit the patient, especially when he has previously suffered considerably from its attacks. For, instead of ceasing altogether after a few days, it seizes the other foot in the same manner as it did the former, both in respect to the vehemence and duration of the pain. Most commonly the foot first affected becomes quite easy, in such a case, and even as strong and healthy as if it had not been diseased; but sometimes both feet are affected together, and with equal violence. When this happens, the succeeding exacerbations, as Sydenham remarks, are less regular both as to the time of coming on, and as to their continuance; but the pain always increases in the evening and remits in the morning; and what is called a fit of the gout, which goes off sooner or later, according to the age and constitution of the patient, is made up of a number of these little fits. For when this disease lasts two or three months, it is not to be esteemed one continued fit, but rather a series or assemblage of small fits, the last of which proves milder and shorter, until the whole is terminated. In strong constitutions, and such as have the gout seldom, the attack is commonly finished in fourteen days; but in those of advanced life, or who have frequent returns of the disease, these series of fits will continue for two months; and in such persons as are more debilitated, either by age or the long continuance of the disorder, it will not

go off till the summer advances, (beginning, as is most common, in January, or early in February,) which seems to drive it away.

When the fit is going off, a violent itching seizes the foot, especially between the toes, and the cuticle peels off. The appetite and strength return sooner or later, according to the greater or less severity of the preceding fit, and the interval of health between the paroxysms is generally nearly in the same ratio; *i. e.* longer in proportion to the greater violence of the last fit. At the beginning of the disease, Dr. Cullen observes, the returns of it are sometimes only once in three or four years; but after some time the intervals become shorter, and the attacks become annual: afterwards they come twice each year, and at length recur several times during the whole course of autumn, winter, and spring; and as it happens that, when the fits are frequent, the paroxysms become also longer, so, in the advanced state of the disease, the patient is hardly ever tolerably free from it, except, perhaps, for two or three months in summer.

Before the disease becomes thus inveterate, however, it has gradually assumed other appearances, and attacked other parts of the body. At first it commonly affects one foot only; but afterwards every paroxysm affects both feet, the one after the other, and then both together; and its changes of place, as it continues to recur, are not only from one foot to the other, but also from the feet into other joints, as the hands, wrists, elbows, knees, &c.; so that there is scarcely a joint in the body that is not, on one occasion or other, affected. It sometimes seizes on two different joints at the same time; but more commonly it is severe in a single joint only, and passes successively from one joint to another; so that the patient's affliction is often protracted for a long time. The pains, indeed, are commonly less violent, in this state of the disease, than they were at first; but, in addition to them, loss of appetite, sickness, and other symptoms of the atonic gout, now afflict him. Besides, in the intervals between the first paroxysms of the disorder, the joints which had been affected were entirely restored to their former suppleness and strength, and were free from pain or uneasiness, and all the functions of life were well performed. But in this protracted condition of the disease, the joints remain not only weak and stiff, after the termination of the fit, but they become at length so contracted and disabled, that although the patient can stand, and perhaps walk a little, yet it is very slowly, and with great lameness and difficulty, so that he is scarcely able to move from room to room; and sometimes the joints lose their motion altogether.

In many persons, though not in all, when the disease has frequently recurred, this immobility of the joints is farther increased by the formation of concretions, of a chalky appearance, upon the outside of them, and for the most part immediately under the skin. The secretion or deposition of this matter is characteristic of the disease, being the consequence of gouty inflammation alone. It seems to be deposited at first in a fluid form, but afterwards becomes dry and firm; in which state the concretions have the appearance of a friable earthy substance, and have been called *CHALK-STONES* (which see). From the investigations of Dr. Wollaston, however, and other modern chemists, it has been ascertained that they contain no calcareous or earthy matter, but consist of a neutral salt formed by the combination of the lithic or uric acid, with the fixed alkali, soda,—constituting a lithate or urate of soda. These concretions form principally about the joints of the toes and fingers, in little no-

doler, which Sydenham compares to crab's eyes; but sometimes they appear about the larger joints, as the elbow and knee, occasioning a whitish swelling almost as large as an egg, which becomes gradually inflamed and red. Mr. Watson has related an example of a very extensive deposition of urate of soda, in a gouty man, who was a martyr to the disease. Chalk-stones not only enveloped the joints of his great toes, formed tumours upon his legs, and, being mixed with the synovia of the large joints, rendered this fluid as thick as cream; but "the joints of the fingers were swelled and knotty, every knot being a lump of chalk; and I was told," he adds, "that when he played at cards, he used frequently to score up the game with his knuckles." (See Medical Communications, vol. i. art. 3.—See also Parkinson's Obs. on the Nature and Cure of Gout, p. 5.)

Such is the progress of gout, as it affects the joints, and while it may, therefore, be called *regular* gout. Sydenham, indeed, and some other writers, confine the appellation of *regular* to gout in the feet only; and consider it as *irregular*, when it attacks the hands or other joints. But Dr. Cullen, Warner, and the physicians of the present day, in general, agree in calling the disease, when it consists only of an inflammatory affection of the joints, the *regular* gout: "and," Dr. Cullen observed, "whatever symptoms we can perceive to be connected with, or to depend upon, the disposition which produces that inflammatory affection, but without its taking place, or being present at the same time, we name the *irregular* gout." First Lines, § 518.

*Irregular* gout, anomalous, internal or atonic gout, as it has been also called, consists of various symptoms of disorder in the internal organs of the body, which do not differ from the symptoms affecting the same organs under other circumstances; it is, therefore, suspected that these symptoms are of gouty origin, when they occur in persons bearing the marks of a gouty diathesis or disposition: and especially when, in such habits, either a manifest tendency to the inflammatory affection of the joints has formerly appeared, or when the symptoms alluded to are intermixed with, and are relieved by, some degree of the inflammatory affection. The morbid symptoms which appear, in such cases, and are considered as signs of *atonic* gout, are principally affections of the stomach; such as loss of appetite, indigestion, and its various concomitants of sickness, nausea, vomiting, flatulency, acid eructations, and pains in the region of the stomach. These symptoms are frequently accompanied with pains and cramps in the upper extremities of the body, which are relieved by the discharge of wind from the stomach. Together with these affections of the stomach, costiveness also commonly occurs; but sometimes a looseness with colic pains. These affections of the alimentary canal are often attended with all the symptoms of hypochondriasis; as dejection of mind, a constant and anxious attention to the slightest feelings, an imaginary aggravation of these, and an apprehension of danger from them. In the same atonic gout, the viscera of the thorax are also sometimes affected, and palpitations, faintings, and asthma occur. And the head also is often disordered, with pains, giddiness, somnolency, and even apoplectic and paralytic affections. (Cullen. See also Musgrave "De Arthritide Anomala," where these various modifications of irregular gout are described at length; and Warner's "Full and Plain Account of the Gout," where his observations are translated, pp. 75—90, second edit.)

We may here remark, in passing, that many errors have probably been committed, in considering almost every species of indisposition, that occurs in gouty habits, as arising

from the gouty diathesis. We recollect to have heard this point strenuously insisted upon by the able professor of physic, in the university of Edinburgh, Dr. Gregory. Many of the symptoms above enumerated are obviously connected with the impaired functions of the stomach, and occur in dyspepsia, or indigestion, in habits not gouty; such are the various hypochondriac sensations; the palpitations of the heart, often arising from over-dilension of the stomach with flatus, by which the heart is mechanically pressed upwards: the cramps in different parts of the body, which are often relieved by a discharge of wind from the stomach; the difficulty of breathing, often occasioned by great dilension of the stomach, which impedes the descent of the diaphragm; and the head-ache, giddiness, &c. which are daily observed to be connected with impaired digestion. On the other hand, inflammatory disorders of the lungs and other viscera, congestions in the head, inducing head-ache, somnolency, vertigo, &c., and ultimately various degrees of paralytic and apoplectic disease, not essentially different, in any respect, from the same affections in habits not tainted with gout, have probably been suffered to go on, and to prove fatal, under a notion that they were gouty, and the proper remedies have been therefore neglected.

The *irregular* gout occurs in a less equivocal form, when the inflammatory state of the joints has come on in the usual manner, but when, without arising to the ordinary degree, or at least without continuing for the usual time, and receding gradually, as is common, the pain and inflammation suddenly and entirely cease, while some internal part becomes disordered. This has been called the *retrocedent* or *repelled* gout. When the gout is thus retrocedent, the same internal parts are attacked, and the same disorders produced, as in the irregular or atonic gout, where no previous imperfect attack upon the joints had shewn itself. The stomach is for the most part commonly affected, whence violent pain, sickness, vomiting, anxiety, &c.: the heart and lungs are also occasionally attacked; and sometimes the occurrence of apoplexy, palsy, or delirium, mark the head as the seat of the retrocedent disease.

Another variety of irregular gout has been denominated *misplaced* gout; namely, when, instead of the joints of the extremities, the stomach, brain, lungs, intestines, kidneys, or bladder, become affected with symptoms of inflammation, which give way upon the appearance of the inflammation in the extremities, when that takes place. This inflammation of the internal organs, however, is indicated by the same symptoms which accompany inflammation of the same parts, arising under other circumstances, and inconstitutions not gouty: and it has probably been sometimes supposed to be of gouty origin, when it arose from the ordinary causes. Dr. Cullen affirms, that he never met with any instances of misplaced gout in his practice, and that no case has been distinctly made out by medical writers, except that of pulmonary inflammation. But he had known two varieties of internal disease alternate with external gouty inflammation; *viz.* the one an affection of the neck of the bladder, producing pain, strangury, and catarrhus vesicæ; the other an affection of the rectum, sometimes marked by pain alone in that part, and sometimes by hæmorrhoidal swellings.

Such are the phenomena, by which the various forms of regular and irregular gout are chiefly characterized. The next object of our inquiry will be the

*Causes of Gout.*—Among the *predisposing* causes of gout, an original peculiarity of constitution, often transmitted from the parent to the offspring, appears to be the most common; in other words, the disease is said to be *hereditary*. This position, indeed, has been controverted, especially by Dr.

Cadogan (see his *Diff. on the Gout*, and all Chronic Diseases, p. 7.); but the discussion has turned upon a mere dispute about words. For it is admitted, on all hands, that the *predisposition* of the constitution to be affected by gout is transmitted from father to son, like other peculiarities of habit; like the family-likeness, for instance, in features, in voice, complexion, &c. It is true, indeed, as Dr. Cadogan contends, that some persons acquire this gouty disposition, who have it not by hereditary transmission; and, on the other hand, that the hereditary predisposition may be counteracted by various causes, but particularly by certain modes of life, so that the disease itself shall never appear. Yet it is equally true, that the same occasional causes, which will excite the disease in those who are hereditarily predisposed to it, will not produce it in others, although applied in greater force; and, therefore, the existence of an original constitutional predisposition must necessarily be inferred. The middle and advanced periods of life are also more disposed to gout, than the early periods: thus it does not commonly attack men until after the age of thirty-five, and generally not till a still later period. When the gout does appear, in more early life, of which there are instances, it seems to be in those in whom the hereditary disposition is very strong, and to whom the exciting causes have been applied in a considerable degree. Hippocrates remarks, that eunuchs are not liable to be affected by gout, nor boys previous to venery: but the intimation included in the remark is probably unfounded; since, with respect to the latter, the disease, as we have already stated, is almost peculiar to an advanced period of life; and the eunuchs, who, in the time of Hippocrates, were chiefly Persian slaves, were doubtless confined to the strict discipline and the frugal and temperate life, which the rigorous laws enjoined to all, and therefore not exposed to the most active causes of gout. For Galen, in his commentary upon this observation of Hippocrates, observes that, in his time, the remark was no longer true, "owing to too much indulgence on their part in an indolent, as well as intemperate mode of life;" and the remark is confirmed by modern experience. (Van Swieten, loc. cit.)

It has been fully ascertained, indeed, that the principal source of the gouty habit consists of high feeding and indolence conjoined. Sydenham (who, upon the subject of gout, stands unrivalled in accuracy of observation, and the model of all succeeding writers, many of whom have done little more than copy his history of it) begins his account of the disease with these remarks. "The gout generally attacks those elderly persons who have spent the greater part of their lives in ease and indulgence, both in the use of high feeding and of wine, or other spirituous and fermented liquors; and who, in consequence of the sluggishness of advanced life, have ceased from all those exercises to which they were accustomed in their youth. The gout, however," he adds, "does not always wait till an advanced age; it sometimes attacks those who are in the prime of life. But these persons have unfortunately received the seeds of the disease from their parents; or, if not, they have indulged in premature and excessive venery, or left off entirely those exercises which they had previously used with great activity, and have been besides most indulgent to the appetite, and drunk to excess of viscid and spirituous liquors, afterwards suddenly turning to those that are thin and cold." (Sydenham, *Tractatus de Podagra*.) These facts have been long known. There is a Greek epigram literally signifying, "of limb-relaxing Bacchus and limb-relaxing Venus is born a daughter, the limb-relaxing Gout." And a similar observation is contained in the adage, "Bacchus pater, Venus mater, et Ira obstetrix Arthritidis." While this fact is confirmed,

confirmed, on the one hand, by the testimony of ages in the affirmative, it is corroborated also, on the other hand, by observation in the negative. Dr. Cullen remarks that gout seldom attacks those who are employed in bodily labour, or who live much upon vegetable aliment, or those who make no use of wine or other fermented liquors. Indeed, the gout is said to be altogether unknown where these liquors are not used, as among the common people of Turkey. Among the lower orders of people, even in this country, the disease is very rare, and still more rare in Scotland and Ireland, where animal food and strong ale and beer are less used. Van Swieten observes, that some people who, from comfortable circumstances, have been reduced to labour for their fullness, and to exchange a luxurious table and indolence for a spare diet and activity, have lost their gout. He mentions particularly the instance of a certain priest, who enjoyed a rich living, and had been an old and constant sufferer from the gout; but happening to be taken by the pirates of Barbary, he was kept constantly at work in the galleys for the space of two years: "which had this good effect, that afterwards, when he was ransomed from captivity, having lost all his troublesome and monstrous fatness, he never once had a fit, though he lived several years after the event." (Van Swieten, Comment. ad Aph. 1255.) Several anecdotes of a similar nature are related by the industrious Schenckius. (Obs. Med. Rarior. lib. v. p. 657. edit. 1644.) In a word, much exercise, which will often counteract the influence of intemperance, will, when combined with temperance, counteract even the hereditary disposition to the disease.

The effect of full living and indolence, in producing the gouty diathesis, is also manifest from the form and temperament of the persons in whom it occurs. These are especially men of robust and large bodies with large heads, and of full and corpulent habits. They have commonly also a coarser skin; and if, with the ancients, we might denote the temperaments of men by certain terms, we should say that the gout especially afflicts men of a *choleric-sanguine* temperament, and seldom attacks the purely sanguine or melancholic. Women are not very liable to the gout, probably from their less intemperate mode of life, in general, than that of men: but those females whom it attacks are generally of robust and full habits. It is said not to occur in them commonly till after the cessation of menstruation; which perhaps only implies that it is a disease of advanced life. For as Dr. Cullen justly remarks, "it often happens to such (the robust) long before the menstrual evacuation has ceased," and he had "found it occurring in several females, whose menstrual evacuations were more abundant than usual." (First Lines, § 494.) A fact, which we may explain, with Dr. Gregory, by observing, that those women who indulge much in vinous and fermented liquors, are more liable to menorrhagia than others.

It is obvious, then, that the experience of all ages concurs in assigning intemperance and indolence as the principal sources of that habit of body, in which the gout is liable to occur. This habit, or predisposition, seems to be sufficient, in many cases, to produce the disease itself, or at least to require the application of slight and imperceptible exciting causes to bring it forth. The disease, indeed, depends so much upon predisposition, that it is difficult to assign the occasional causes; the same agents appear to be sometimes the generators of a predisposition to it only, and at other times actually to excite the disease.

The *exciting causes* which often suddenly bring on a fit of the gout, in those who are predisposed to it, are, in the first place, those circumstances which induce a sudden debility, especially of the stomach. The concurrence of *indigestion*,

and the local inflammation in gout, are characteristic of the disease; and, as we have already stated, the latter is usually preceded for some time by the former. Hence whatever suddenly depresses the digestive power, is liable to induce the local and constitutional disease. Thus a paroxysm of gout has frequently been excited by an occasional excess in the use of wine or spirits; by overloading the stomach with food, or by eating such as is not easily digestible in its nature; by the copious use of vegetable acids or accefcnt matter, especially by weak accefcnt wines, punch, &c.; all of which tend to debilitate the digestive organs either directly or indirectly. In the same way, excess of venery, which powerfully influences the stomach, (Van Swieten, Aph. 586, and 1255,) has often brought on a fit. This seems to have been universally understood by the ancients. We have already noticed the observation of Hippocrates; and Aëcius, in recounting the general causes of gout, says, that are, "abounding crudities, frequent drunkenness, and, above all, an immoderate use of venery." (Sermon. iii. Cap. 6.) Sydenham and Van Swieten add their testimony to the fact. Intense study, night-watching, excessive anxiety and attention to business, all of which greatly depress the power of the body in general, and of the stomach in particular, destroying the appetite, and producing a sense of uneasiness, sinking, or weight about the region of the stomach, are likewise enumerated among the occasional causes of the gouty paroxysm. The same is true with respect to the violent emotions and passions of the mind, more particularly of anger. "Ira obliatrix arthritidis" is part of the adage above quoted: and the three causes of gout, insisted on by Dr. Cadogan, are intemperance, indolence, and *vexation*. The influence of violent mental emotions on the functions of the body is, indeed, very manifest, and more especially on the function of digestion; the disturbance of which, we have already observed, is exceedingly instrumental in the production of gout. "The first immediate effect of violent grief or vexation," says Dr. Cadogan, "is to take off the action of the stomach entirely. Let us suppose a man in the best health, the highest good humour and spirits, as well as good stomach, sitting down to dinner with his friends, receives suddenly some very afflicting news. Instantly his appetite is gone, and he can neither eat nor swallow a morsel. Let the same thing happen after he has made a hearty cheerful meal, as suddenly the action of his stomach, the whole power of digestion is cut off totally, as if it were become paralytic, and what he has eaten lies a most oppressive load. Perhaps as the excess of weakness is often convulsion, it may be rejected by a violent vomit, or do greater mischief: for which reason such strokes of distress are less hurtful received upon an empty than a full stomach." &c. (Loc. cit. p. 55.) The gouty habit, indeed, is often an irritable habit; and Sydenham observes, that a fit of gout may be called a fit of anger. (See also Van Swieten, § 1258.)

Among other exciting causes of gout, the sudden ceasing from the customary exercise or labour is commonly mentioned, and its principal effect is probably upon the function of digestion, which is so much under the influence of exercise. Indolence, in general, as contributing to induce the gouty disposition, is well understood; and the sudden cessation of activity, like all other sudden changes, is apt to produce a sudden accession of the paroxysm, in those who are predisposed to the disease. In a similar manner, a sudden change in the mode of living, the opposite to excess, namely, from high feeding to a very spare and abstemious diet, is liable to induce the paroxysm of gout. That such a sudden abstraction of the powerful stimulus of a copious supply of food and strong liquors, must necessarily induce a considerable

direct debility in the organs of digestion, is well understood by those who are acquainted with the laws of stimulants on the animal body. (See DEBILITY and EXCITABILITY.) This fact, however, although sometimes adduced as an argument against the advantages of an abstemious regimen, in preventing the gout, affords no such legitimate inference. It is too obvious, indeed, to require an elaborate discussion, that all extremes, hastily adopted, are liable to derange the animal economy; and that habit alone can render extreme moderation invariably beneficial, on the one hand, and enable us to bear excess with a considerable degree of impunity on the other. Another mode of debilitating the system, which sometimes brings the paroxysm of gout, is excessive evacuation of any kind; such as by hæmorrhage, brisk purging, vomiting, &c.; especially in aged persons, whose constitutions are already much broken down by the disease.

Sudden vicissitudes of weather, especially when connected with moisture, as from mild to cold, or from severe cold to damp and mild weather, often excite the gout; hence, Sydenham remarked, that the most frequent occurrence of the gouty paroxysm takes place in the latter end of January, or the beginning of February. The fit may be produced either by the local application of cold and moisture to the feet, or by a general exposure to it; for such exposure, which in most people will occasion rheumatism, a catarrh, or a sore throat, will, in a gouty subject, excite a fit of the gout. In like manner, bruises or sprains of the leg or foot, or mere over-exercise of the muscles and ligaments of those parts, as in long walking, will sometimes bring on a paroxysm.

There is another alleged cause of the gout, which it would not now be necessary to mention, were it not noticed by Boerhaave, Van Swieten, and others, *viz.* contagion. Van Swieten considers the disease as analogous to dysentery and other maladies, which, although originating from very obvious causes, nevertheless propagate themselves afterwards by contagion. But the stories, by which this doctrine is supported, are somewhat ridiculous; such as this, that a dog lying at his master's feet during a paroxysm of the gout, suddenly ran howling and barking round the room, expressing the pain which he had caught from his master, whose torture at the same time became greatly alleviated, &c. (Swieten Com. ad § 1255.)

*Of the Diagnosis*—The attack of the *regular* gout is readily distinguishable from the only disease which resembles it, *viz.* acute rheumatism, if all the symptoms are taken into consideration. In the first place, gout is commonly a disease of advanced life; acute rheumatism is most frequent from the age of 18 to 30. Nor does rheumatism, like the gout, seize the feet in preference to the other joints, or remain for a considerable time in the same joint; but at the first attack it often attacks every joint of the body in succession, and sometimes continues for several months. The colour of the skin of the part affected in rheumatism, if it be changed, is only slightly red, whereas it becomes of a deep bright red in the gout. The pain in the rheumatism is not extremely acute, while the part is at rest, but becomes violent when it is moved only; which is not the case in the gout. And the symptoms of indigestion and disordered stomach, which precede the paroxysm of the gout, together with the marks of distinction just mentioned, will serve particularly to determine the nature of the paroxysm. It must be admitted, however, there are instances of the combination of the symptoms of the two diseases, which renders it difficult to decide to which of them the individual examples belong. (Heberæus, Comment. de Morb. p. 58.)

Again, the symptoms which the *irregular* gout presents, are extremely numerous and proteiform, appearing frequently as dyspepsia, hysteria, hypochondriasis, asthma, palpitation, syncope, vertigo, apoplexy, paralysis, &c. according to the original or acquired tendency of the constitution to those diseases. Hence the discrimination between these modifications of gout, and the disease which it mimics, is occasionally very difficult.

*Of the nature or proximate cause of Gout.*—This is a part of the subject upon which, if we were to confine ourselves to the communication of actual and useful knowledge, we should be altogether silent, or say but a few words. The observation, indeed, will apply to many other diseases, as well as to gout; but as gout is an affection almost exclusively occurring in the higher classes of society, among the wealthy and intelligent, it has claimed a more general attention, and become the object of more general discussion. It is greatly to be lamented, however, that the most mistaken notions have prevailed, from the earliest times, in regard to the nature and extent of the insight, which we are capable of obtaining, into the operations of the animal economy, and to the means by which we can obtain it. Instead of confining themselves to the observation of the phenomena of health and disease, faithfully recording these phenomena, and arranging them according to their most obvious analogies, physicians have been busy in searching after their hidden causes; and, fancying a resemblance between the most dissimilar things, have successively called to aid the analogies of every human science, as it advanced in cultivation, to explain the phenomena of animal life. The ancient doctrines of numbers and elements, and their qualities, and the modern discoveries and suppositions of the chemical, mathematical, and mechanical philosophers, have in turn been assumed as affording the most perfect elucidation of the operations of the living body; and, as they have, of course, been in turn exploded, we need not recur to any other argument in proof of their want of foundation. By these remarks we wish only to shew the futility of reasoning on the subject of proximate causes of disease, which, as we are and must remain entirely ignorant of the proximate cause of health and life, must be equally inscrutable. “Nam quæ demum causa,” as Celsus justly observes, “vel secundam valetudinem præsentem, vel morbos excitent, &c. ne sapientiæ quidem professores scientia comprehendunt, sed conjecturâ profectantur” (De Med. Præf. lib. i.) The inquiry respecting the proximate cause of diseases is as futile as the speculations of the Cartesians to explain the essence of gravitation, and have as little to do with the advancement of true medical science, as the hypothesis of an ether assisted Newton in his observations and calculations respecting the phenomena of that agent.

If these observations should not be sufficiently intelligible to the general reader, a brief enumeration of the hypotheses, which have been invented by medical writers, in order to explain the essential nature of gout, will probably be sufficient to prove the absurdity of such attempts. Most of the Greek and Roman physicians, with the exception of the methodists, considered the presence of a corrupted humour in the small vessels as the essential cause of gout. Hippocrates believed this humour to consist of bile and phlegm, which flowed upon the joints. Galen followed him in supposing the defluxion upon the joints to be chiefly pituitous or phlegm, or bile mixed with phlegm. Paulus Ægiæta attributed the disease to a redundancy of blood, black bile, and phlegm. Trallian and Cassius imagined, that it arose from the blood itself being forced into the joints; and Orbanus affirmed that the blood in gouty people was viscid, resembling



resembling melted glass, which remaining in the joints, produced the cretaceous matter. Aretæus, one of the most able of the Greek writers, is the only one who passes over the essential cause of the disease, a knowledge of which he assigns to the gods alone; the evident causes, he says, are apparent to man. Themison, Cælius Aurelianus, and the methodic sect, attributed gout to relaxation or stricture of the parts; some, however, imputed it to the one state, and others to the opposite. The Arabians followed closely in the path of their masters, and taught that one or other of the humours was predominant, or that they were variously combined, in cases of gout. So luminous and instructive were the doctrines of the ancients!

In the dawn of modern science, the humours were almost banished by the hypotheses of the chemists; but although we hear little more of bile, phlegm, and melancholy, or black bile, all disease was nevertheless attributed to a morbid or peccant matter, and salts, earth, or tartar, were deemed the immediate cause of gout and other maladies; and Paracelsus, Van Helmont, and others, are very abusive of the ancients for promulgating so many absurd doctrines! When the mathematical and mechanical physicians arose, they took up the hypothetical doctrines of their predecessors, and reasoned concerning the action of these supposititious humours, salts, &c. upon mechanical principles; the chemical doctrines predominated, however, over the ancient humours. Thus, to use the words of Dr. Warner, "according to Sydenham the artiritic matter consists of the putrefying heat and acrimony of indigested juices: Boerhaave gives it the appellation of an acrimony or over-toughness of the liquid which waters the nervous parts: Lister makes it to be a crude and viscid serum become ichorous and corrosive: Bennet defines it an acrimony that is invariably of the putrid, volatile alkaline nature: Quiney says that it consists of rigid particles, such as approach near to the saline, of the nature of tartar, and not much unlike that which forms itself into concretions in the urinary passages: Cheyne in one place calls it tartarous, urinous, or other salts: Ingram will have it to be a coagulation made by a mixture of saline particles with the oil of the adipose membrane. As every one of these writers makes the gouty matter to be an acrimony taken in with our aliment, which they call either putrid, viscid, corrosive, saline, urinous, or tartarous, so Dr. James, whose name needs no addition, disagreeing with them all, hath judged this acrimony to be earthy." (See Warner on the Gout, p. 91.—See also a sensible and learned dissertation on this topic, in "An Historical, Critical, and Practical Treatise of the Gout, by Thomas Thomson, M.D. Lond. 1742.) But such hypotheses did not die with Dr. James; for in a treatise on the gout, published in 1805, we find the following statement: "The proximate cause of gout appears to be, a peculiar saline acrimony existing in the blood, in such a proportion, as to irritate and excite to morbid action, the minute terminations of the arteries, in certain parts of the body." (See Observations on the Nature and Cure of Gout, &c. by James Parkinson.) a statement, which is equally indefinite, hypothetical, and practically useless, with those that have preceded it.

On reviewing these opinions of men, who have been deservedly esteemed the ornament of their profession, some readers may express their surprize that such an extraordinary difference should be found among them, and that so much error (for of opposite opinions one half at least must be wrong) should exist in the science. But the only rational ground for wonder is, that so many men of sound understanding should have employed themselves in inquiries beyond the reach of their faculties, and should have imagined that,

in framing hypothetical suppositions, they had acquired any actual knowledge, or had advanced one step in the practical improvement of their art. If a number of philosophers were engaged in investigating the nature of light and heat, and should not only execute a series of experiments on the reflection, refraction, and divisibility of the one, and on the properties of expansion, inflammation, vaporization, &c. of bodies, which belong to the other; but should likewise think it necessary to form conjectures relative to the nature and qualities of the sun, which is the source or proximate cause of both; these conjectures, like the medical hypotheses just quoted, however they might amuse us, would add not a tittle to our knowledge, nor would the want of them be any diminution of our information, or of our practical powers.

The great source of these hypotheses, respecting the existence of a morbid humour in the gouty habit, is, no doubt, the appearance of a palpable matter, of a peculiar nature, in the joints diseased. This chalk-like matter, however, will be found to afford no ground for such a conclusion, if the circumstances are duly examined. In the first place, the production of this morbid matter may be the effect of the disease; and that it is so, is apparent from its not occurring in all cases of gout, and from its seldom or never accompanying the first attacks of the disease, but only appearing after repeated paroxysms. Nor have we any direct evidence, from experiment or observation, of the smallest difference in the blood or other humours of gouty people, from those of other persons. On the other hand, we know that the vessels in particular parts acquire the power of secreting or otherwise producing new fluid, when inflammation is induced. Thus a blow in a fleshy or membranous part shall occasion inflammation, and a considerable quantity of pus shall afterwards be accumulated or discharged, as in a common abscess; yet no one supposes that this pus was contained in the mass of the circulating blood, any more than he supposes that urine and bile are contained in that mass, and not elaborated by the kidneys and liver. The appearance of the chalky matter, or urate of soda, in the parts attacked by gouty inflammation, is therefore to be considered as the result of that inflammation, and not as its cause. If the general mass of blood were contaminated with this morbid matter, or any peculiar acrimony tending to produce it, why is it never deposited on the viscera and other internal parts? yet no such deposition was ever observed; those parts remain invariably free from it in the most inveterate forms of the gout, and the appearance of chalk-stones is confined exclusively to the membranous and ligamentous parts which exhibit inflammation externally. In the next place, the frequent and sudden translocation of the disease from one part to another is not consistent with the supposition of its dependence on the presence of a morbid matter: but analogous changes or translocation of other inflammations, in which no peculiar matter is produced, are exceedingly common. Beside, upon the supposition of such a translocation of morbid matter, its operation should be similar on every part; whereas it seems to be very different, being stimulant and exciting inflammation in the joints, but sedative and destroying the tone or energy of the stomach. Farther, as Dr. Cullen justly observes, "the supposition of a morbid matter is quite superfluous; for it explains nothing, without supposing that matter to produce a change in the state of the moving powers; and a change in the state of the moving powers, produced by other causes, explains every circumstance, without the supposition of a morbid matter: and to this purpose it may be observed, that many of the causes exciting gout do not operate upon the state

of the fluids, but directly and solely upon that of the moving powers." Dr. Cullen likewise remarks, that the supposition of a morbid humour being the cause of gout has been hitherto useless, since it has not suggested any successful method of cure: but, on the contrary, that particular suppositions have often corrupted the practice, and have frequently led from those views, which might be useful, and from that practice which experience had approved. (First Lines, pt. 530.)

Having failed to explain the phenomena of the disease, on the supposition of a morbid condition of the fluids of the body; we might take up the doctrine of the *nervous* pathologies, and attempt an explanation of the symptoms, upon the notion of a derangement of the living solid, or moving fibre, as Dr. Cullen has done. (Loc. cit. §. 533—6.) But it is sufficient to peruse the account given by that celebrated physician, to be convinced that it is a mere repetition of the phenomena of the different varieties of the disease, couched in a new phraseology; and therefore that it is practically as useless as that which he controverts. It cannot be questioned, we apprehend, in the present state of our physiological knowledge, that the prime agents in the operations of the living body, whether in health or disease, are the solid, irritable, and moving parts; and that by these the fluids or humours are chiefly elaborated and modified: but it is likewise obvious, that the solids derive their powers from certain conditions of the circulating fluids, which are varied by respiration, nutrition, &c. Therefore the disputes between those, who confine the origin of gout to the one or other part of the system exclusively, must be deemed frivolous. Our knowledge is necessarily limited to the phenomena of the disease, and the order in which they occur, and to the effects of physical agents upon them, as taught us by observation and experiment. "Nulla tamen adhuc obscurior questio est," says Dr. Heberden, "quam quæ versatur de hujus morbi causis, effectibusque, et remediis." (Comment. de Morb. Cap. 9.) But we cannot doubt that these numerous hypotheses, which have at once diverted the minds of physicians from the labour of observation, and have perverted their views of facts, have rendered the subject more obscure than it would otherwise probably have been.

Before we come to the method of treatment, there is another question to be noticed, upon which much discussion has taken place, and which has perhaps been popularly solved with considerable incorrectness: we mean the question, whether regular fits of the gout are salutary; *i. e.* whether they altogether remove or prevent other complaints. The affirmative is generally maintained: and this opinion has arisen partly from observation, and partly from the hypothesis, that a paroxysm of gout consists in an effort of the constitution, by which the morbid matter is thrown off through the part affected. In a number of instances, beyond a doubt, the various symptoms of indigestion, whether affecting the stomach and bowels only, or the lungs and heart by vicinity, and the head by sympathy, are relieved or altogether carried off by the complete fit. Perhaps Dr. Heberden is scarcely correct, when he considers this relief as either, in a great measure imaginary, like that which many invalids invariably obtain from a change of their physician, or from a new medicine; or as not more frequent than similar relief from slight indisposition after other violent diseases: he appeals, however, to an ample experience in support of his opinion. He thus writes: (we translate from the Latin edition) "There are some countries in which the itch is a very frequent disease, and there this eruption is deemed salutary. Even an ague was formerly considered by

the majority of physicians as a wholesome affection, and is still so considered by some persons: its occurrence was therefore a subject of congratulation both with the patients and their friends, and every precaution was taken not to get rid of it too soon. But these notions are almost exploded in this country; and if we shall discover a remedy equally effectual for the gout, as those with which we cure the diseases just mentioned, we shall at length learn with what perfect safety and advantage the gout may likewise be eradicated."—"I confess," he adds, "that I have seen some persons who rejoiced on the first attack of the gout, as if it assured to them all future happiness, and who, dreaming only of the most perfect health to come, easily persuaded themselves that this first fit had been wonderfully beneficial. This is a common disposition with mankind, as often as they have recourse to new physicians, or to remedies not before tried. But, passing by such persons, let us inquire the opinion of those, who have suffered under long and frequent paroxysms, and who are better acquainted with the disease. Of a very great number of patients whom I have seen, and whose cases I have committed to writing, more than twice as many, to say the least, have found no relief whatever from their previous complaints, in consequence of the regular fit, or have even suffered an increase of them, as have seemed to derive any benefit: and, in my opinion, the evils which were attributed to the disease, more certainly originated from that source, than the supposed advantages. Occasionally, indeed, we find that other complaints have ceased on the supervention of the gout; but the same thing also happens after acute fevers, after palsy, asthma, small-pox, and insanity, of all which I have witnessed many examples; yet no one will call these diseases salutary. On the other hand, gout frequently occurs to persons affected with vertigo, asthma, indigestion, and melancholy; where, so far from alleviating these disorders, it produces a considerable aggravation of their symptoms. Besides, in some patients, all these complaints constantly accompany the paroxysm of gout, and continue during the whole of its course." (Loc. cit. p. 36.)

At all events, if we look at the life of the gouty in general, we find ultimately but little ground for congratulation. In some, it is true, the disease occurs at distant intervals, and soon goes off, and therefore occasions very little, if any, obvious injury. Even epilepsy itself, when its attacks are rare, does not prevent the patient from reaching old age. But this is far from being the case frequently with either disease. In many persons whom the gout attacks, the health suffers from the time of the first fit, and gradually grows worse, until it is greatly broken, or fails altogether. It may possibly be doubted, in such cases, whether the gout caused these evils; but we are very certain that it has not been the remedy for them, nor in any way salutary.

We may justly wonder, therefore, with Dr. Heberden, how it has come to pass, that the gout is held in so much honour in England; unless it be that it is a disease, which several great men have suffered, and which chiefly attacks those happy personages who enjoy leisure and affluence, and all the good things of life. Louis XIV. of France happened to labour under a fistula in the anus, and the surgeons of that time were constantly called in by his fashionable subjects to administer relief to imaginary fistulae; which royal disease they persuaded themselves had attacked them: and it is probable, as Dr. Heberden suggests, that had there existed any medicated waters in France, capable of producing fistula, they would have been visited with the same anxiety with which our countrymen hasten to those of Bath, in the hope of returning with the gout.

*Of the Cure.*—Perhaps this may be deemed an improper term for the treatment of a disease, which, on the one hand, has been affirmed to be incurable by medicine, and called the opprobrium of physicians; and, on the other, has been considered so salutary, that it ought not to be cured, and could not be cured without the most imminent danger to the patient. Nay, farther, as much trouble has been taken to produce and excite the gout, as to relieve or cure it; and all the evils which arthritides suffer, are not supposed to arise from a superabundance of gout, but because they have not had enough. It would be only justice, however, as the intelligent writer just quoted remarks, to the art of physic, no longer to call the disease its opprobrium, until the patients lay aside their prejudices and fears, and have a disposition to be cured. “*Utinam,*” he adds, “*tam in promptu esset invenire, quam tutum adhibere, podagræ remedium.*” (Comment. p. 43.)

The treatment, it is obvious, must be necessarily very different according to the different forms of the disease, the different periods of life, and the state of strength of the patient, &c. We shall first speak of the practice necessary to be pursued in the regular gout; which will resolve itself into the treatment requisite during the fit, and that which is proper during the interval.

*Treatment of the Regular Fit.*—All active measures, during the occurrence of a regular paroxysm of gout, have been prescribed by writers in general since the days of Sydenham. This physician remarked, that the more violent the pain and inflammation, the shorter in general will be the fit, the recovery most perfect, and the interval between this and the succeeding paroxysm the longer. If this opinion were admitted as just, it would suggest the prohibition of any remedies which might moderate the inflammation. But against this doctrine another hypothesis has been advanced by Dr. Cullen, which is at least equally plausible, and better supported by analogy, if not by fact: namely, that the violence of the inflammation may weaken the tone of the parts, and while it renders them less liable to similar violent attacks, and the consequent more perfect recovery, may, by that very debility, invite a return of the disease. On the whole, the indications of practice generally pursued at present, are to moderate the violence of the inflammation and febrile action, when it is severe, without applying any active remedies to the foot itself. After enumerating the various external applications, such as poultices, fomentations, blisters, sinapisms, camphor, and stimulating substances, which have been occasionally recommended, Dr. Cullen concludes, that from any of them there is danger of rendering the gout retrocedent; “and that therefore the common practice of committing the person to patience and flannel alone, is established upon the best foundation.” As there is no danger from the fit of gout, when regular, in a constitution not much broken, this method may be pursued with a certain degree of impunity; but it cannot be questioned, that the loads of *flannels*, which are sometimes used, often augment the necessity for a supply of *patience*, by increasing the inflammation and pain in the foot. It is true, that the parts thus swelled and painful, are more acutely sensible to cold, as well as to other impressions, than in health; but no covering beyond what is sufficient to prevent a troublesome sensation of cold, if that should occur, can be necessary. (Heberden.) All poultices, fomentations, and warm bathing during the inflammatory stage are pernicious.

It is more than probable, that considerable errors have been committed, upon the hypothetical notion of keeping the gout in the extremities, at least in the younger subjects of gout, by deviations from the antiphlogistic regimen. In

such subjects, various and fermenting humors, which are either obtained from during the fit; and the evacuations of light aqueous and vegetable matter, which are voided by the bowels should be kept open by laxatives. Some have thought the skin moist by diaphoretic, or the natural fluids. There is at least a palliative system, and the prejudice of many physicians are averse to any more active interference with the disease. But in case the inflammation is extremely violent, in young and hale men, Sydenham, Cullen, Huxham, and other able authorities, concur in recommending the employment of blood-letting from the arm. This, however, they do not recommend to be often repeated, on account of the debility which may ensue; and as the part affected is not an organ so important to life, and the inflammation so purely local, it does not appear to be any good reason for recurring to this remedy, except in cases of extraordinary violence, in plethoric habits, in which the symptomatic fever itself might prove hurtful. Local blood-letting, by means of leeches applied to the foot itself, promises more advantage, and experience itself has proved the efficacy and safety of the practice. (See Cullen, First Lines, par. 563—Mufgrave, de Arthrit. regulari, cap. 8. § 4.) Cupping and scarification, the neighbouring parts have also been found beneficial.—(Mufgrave.)

We are persuaded that hypochondria has had much more influence than observation and experience, in exciting the general fears about interfering with the progress of the acute inflammation, and of the danger of its being driven to some internal part by such interference. When it was believed, that a quantity of morbid matter existed in the local part, it was inferred, of course, that it could only be removed by expulsion or by repulsion, in which last case it might fall upon some other organ. We know very well, that the same hypothesis, and the same fears prevailed no long time ago with respect to cooling the skin in fevers; and especially in eruptive fevers, such as scarlet fever and small-pox. “The perspiration will be checked,” said the theorist, “if you allow the skin to be cooled, and the *pus* must therefore be thrown back upon the bowels, or the lungs, or the brain, and the effect may be fatal.” But ample, and unvarying experience has now demonstrated, not only that such danger was altogether imaginary, but that washing the skin with cold water, even under the full eruption of scarlatina, and in the eruptive fever of small-pox, affords the most grateful relief to the patient, and is the most effectual moderator of his disease. (See Cold, *Effects of it a rem.* &c.) Nor is a considerable experience of the safety and efficacy of a similar practice, in subduing the inflammation of gout, wanting. The great Dr. Harvey himself, whose name is an established by the discovery of the circulation of the blood, was in the habit of immersing his foot in cold water, as soon as he perceived the approach of the gout, and thus removed the disorder: he lived to the age of eighty. Van Swieten mentions an officer of infantry, who was induced to rub his galled feet with snow, and afterwards, emboldened by success, walked a little way bare-foot upon the snow, and returned quite free from pain: the interval before another fit was also lengthened by this practice. Similar observations were likewise made by the ancients. Aetius informs us, that he had seen a person labouring under what he calls a bilious gout, who obtained extraordinary relief from immersing and keeping his feet some time in cold water. And it is an aphorism of Hippocrates, that “cold water, copiously poured upon swellings of the joints, painful ulcers, *gangrenæ*, and convulsed limbs, lessens and removes the pain.” (Aph. 25. sec. 5.—See also Heberden Comment. p. 45.—Van Swieten, Com. ad Aph. 127.3.) But the most extensive evidence

of the efficacy of this practice, in *curing* the paroxysm of gout, has been adduced by Dr. Kinglake, (see a Dissertation on Gout, &c. Lond. 1804,) who brought forward about thirty cases, in which the application of cold water to the inflamed part, during the gouty paroxysm, was invariably and speedily successful in relieving the pain and removing the disease, without any untoward circumstance ensuing. Dr. Kinglake maintains, that the inflammation of gout is to be treated upon the same principles as other local inflammations, and yields to the same treatment. That this proposition is correct, while the constitution remains unbroken, we fully believe; but to what extent the principle will hold, in those whose system is greatly debilitated and decayed, as well by age as by frequent and protracted disease, remains as yet undetermined by experience. With the diminished strength of the patient, the paroxysms become diminished in violence, and active remedies are, therefore, the less required; but from what we have detailed above, it appears at least highly probable that, in the first attacks of gout, the application of cold, judiciously employed, so as to remove the morbid heat and no longer, would always be safe, and would contribute as well to shorten the paroxysm, as to diminish the suffering of the patient, and to preserve the joints from the injury, which protracted inflammation and morbid effusions necessarily occasion.

The operation of *purgatives*, which is known to be essentially useful in other inflammations, has been considered as beneficial in the gout by some physicians, but has more commonly been altogether forbidden. Sydenham expresses himself very strongly in prohibition of purging, at any period of the fit, or even in the interval of health. Had he expressed his conviction upon this point simply as the result of experience, we should have been disposed to bow to his authority; but his theory appears to have had at least an equal share in producing this conviction; and unfortunately this theory involves the most gross contradiction. In the beginning of the paroxysm, we are told that there is great danger lest purgatives should stop the inflammation of the foot, "by throwing back into the mass of blood that *peccant matter*, which nature was protruding to the extreme parts." (Tractat. de Podagra.) But after the termination of the fit, there is extreme danger, "lest a new paroxysm in the foot, equally severe with the former, should be produced by a purgative." (Ibid.) So that this theory blows hot and cold, like the fable in the fable; and these dangerous purgatives draw the *peccant matter* out of the foot, when it happens to be in, and are the most effectual means of throwing it into the foot after it has been driven out not only from the foot, but from the whole body (according to the hypothesis) by nature!

Sydenham, however, lived long enough to retract, in part, his opinion respecting the injurious influence of purgatives in the gout, especially if the milder ones are used, and an anodyne given after the operation. (Dissert. de Mictu Sanguineo, &c. 1686.) Van Swieten observes, "many physicians are of opinion, that part of the gouty matter may be carried off by purgatives, and the fit rendered much more mild, especially if it be occasioned from errors in diet;" and he quotes Hoffmann, who recommends gentle purgatives in all cases of local pain, and has mentioned an instance in his own person of the most striking benefit derived from a purgative taken immediately before the fit of gout. An instance has been related to us, in which the gout was completely banished, during a space of nearly twenty years, by the use of a brisk purgative, taken when the first symptoms of the fit began to appear; the medicine employed in this instance consisted principally of scammony,

in the dose of about fifteen grains. We have seen this medicine used in a few cases, with some relief, in smaller doses, and without any untoward consequences. That purgatives, as well as cold applications, may be resorted to with advantage in the beginning of the paroxysm of gout wherever the constitution is unimpaired, we consider as tolerably well established on the grounds of observation; although we do not doubt that many of the cases of repelled gout, which have been attributed to such causes, may have really occurred, under circumstances of broken and feeble constitution, or of peculiar idiosyncrasy. But the accidents arising from a careless or injudicious abuse of any practice, afford no just argument against the rational and cautious use of it.

We apprehend, however, that many disorders have been very erroneously attributed to repulsion of the gout, which might be more correctly explained upon other grounds. For every inflammatory disease that occurred, even at the distance of several months from the cessation of the fit, has been considered as the result of the premature cure of the gout: whereas, it is next to impossible that so long an interval could have taken place between the cause and its effect; and, on the other hand, as gout is most frequent in plethoric habits, which are also most liable to inflammatory diseases, the occurrence of pleurisy or apoplexy, in such cases, is doubtless to be attributed to the plethora, and not to the previous gout. Dr. Cullen mentioned that he had known about twenty persons die suddenly, more than half of whom were of gouty habits.

The violence of the pain, in the paroxysm of gout, would naturally suggest the use of opiates: but experience has shewn that opium, in any form, when administered in the beginning of any inflammatory disease, with which much heat of skin and great febrile excitement are connected, generally fails to give relief; on the contrary, that it tends to increase the heat, fever, and restlessness, and, with them, the pain likewise. When, however, the violence of the paroxysm is somewhat abated, yet continues to return, so as to occasion painful and restless nights, opiates may then be given with safety and with advantage, especially in the case of persons advanced in life, and who have been often affected with the disease. The hypothetical objection to the use of opiates, that they tend "to lock up the morbid matter," is altogether groundless. Dr. Warner speaks with delight of the soothing influence of opium in the fits of gout, which he suffered in the latter periods of his life. (P. 133—136.)

Hitherto we have seen that the practice, generally pursued in the paroxysm of gout, is merely palliative; an actual cure being deemed a desideratum by most persons, and a thing improper to be attempted by others. Of late, however, a medicine has been introduced into this country from France, which is said to possess a specific power over the gouty paroxysm, which it removes "*cito, tuto, et juvencé.*" The composition of this medicine is at present unknown, but it has been ascertained that it is a vegetable matter, and it is said by the inventor to be a plant heretofore not used in medicine. It is called *eau medicinale d'Huffon*. It has appeared, in many instances in which it has been employed in this country, and that in persons of the first rank and character, to possess the power of removing the paroxysm of gout in the course of twenty-four hours, leaving the patient in a state of good health, and in possession of the same use of his limbs which he enjoyed before the fit. It is said that, in general, it increases the various excretions considerably, if taken in the full dose, producing several loose motions from the bowels, a free perspiration, and an increased dis-

charge of urine. But the influence of the medicine on the gouty paroxysm is not attributed to these evacuations; since, in some instances, in which a smaller dose was taken, a similar relief to the gout was procured, without any increase of the excretions. No untoward circumstance whatever has yet occurred, in consequence of the speedy removal of the paroxysm: but farther experience will be requisite to enable us to form a satisfactory estimate of its properties. (See an Account of the Eau Medicinale d'Huffon, by Edwin G. Jones. M. D. Lond. 1810.)

*Treatment in the Interval.*—Whatever method is adopted in the treatment of the fit of gout, whether it be merely palliative, or so active as to shorten the attack, the constitution retains its predisposition, and is equally liable to suffer a return of the disease. It is not yet ascertained, we believe, whether the fits, when warded off by the *eau medicinale*, do not recur more frequently. It is the treatment of the patient in the interval of health, by which alone the disease can be cured, i. e. the paroxysms prevented from returning, and the gouty diathesis eradicated. How this is to be effected, we cannot learn from a view of the proximate cause, or essential nature of the disease; for upon this point we have no actual knowledge: but, as we possess some knowledge of the exciting causes of the disease, or of the circumstances which generate or foster the predisposition to its attacks; so, by removing these, we may hope to prevent the production of that predisposition, or to diminish it, if not to remove it altogether. Now, we have seen that intemperance and indolence are the parents of the gouty diathesis, where it is not hereditary, and are the chief agents in exciting it to activity, where it is. The inference, then, is obvious: by *temperance* and *activity*, and not by medicine, the return of the gouty paroxysms is principally to be prevented.

There is, perhaps, no subject, on which Englishmen in general entertain so many unfounded prejudices, or listen to argument with so little attention or conviction, as that of *temperance*. It is conceived that physicians, in inculcating the advantages of it, only talk idly about it, in the way of their profession; and that what is called good living, when not carried to actual debauch, is favourable to the support and health of the body. It is, indeed, so universally the practice, in this country, to indulge an artificial appetite, beyond the actual wants of nature, that temperance is a thing, as Dr. Cadogan observes, of which an Englishman can acquire no idea at home. It is, however, altogether comparative with respect to individual constitution; for some persons will become plethoric to a morbid degree, upon diet which is barely sufficient to support life in others. Perhaps Dr. Cadogan's test is correct. "As long as a man eats and drinks no more than his stomach calls for," (i. e. when unexcited by variety of dishes, by sauces and condiments, or by interposing liquor of any kind) "and will bear without the least pain, distention, eructation, or uneasiness of any kind, &c. he may be said to live in a very prudent well-regulated state of temperance, that will probably preserve him in health and spirits to great old age." (On the Gout, p. 31.)

We know too well, however, the general want of power or inclination to resist the pleasures of the table, with that degree of perseverance and to the requisite extent, to expect that many cures of the gout will be effected in this way; but this we may assert, that the only instances of the eradication of the disease, which are known, have been accomplished by rigid and persevering temperance. Dr. James Gregory, the present professor of medicine in the uni-

versity of Edinburgh, is a remarkable example of the perfect cure of the gout by such means. Born of gouty parents, he was attacked severely when young, and suffered several paroxysms, which, after being banished by abstemious living, recurred on a short indulgence on revisiting Oxford; but he has since that time entirely kept the foe at a distance for about thirty years, by extreme temperance and much exercise, and is now hale and strong, though advanced several years beyond the age at which his father died, broken down by the gout. This he repeats annually to his pupils with no small exultation. His diet has been chiefly broth, or a sparing quantity of plain animal food, with little or no wine. Dr. Cadogan affords another instance of the benefit of rigid temperance in his own person, "having not only got rid of the gout," he says, "of which I had four severe fits in my younger days, but also emerged from the lowest ebb of life, that a man could possibly be reduced to by colic, jaundice, and a complication of complaints, and recovered to perfect health, which I have now uninterruptedly enjoyed above ten years." (Loc. cit. p. 83.) Dr. Heberden likewise observes, that although complete cures of the gout are extremely rare, yet he has seen more than one instance in which, by a total abstinence from animal food and wine, the patients were restored from a state of extreme debility and misery, to such a degree of health and strength, as rendered their life no longer useless to others, nor painful to themselves. (Comm. p. 44.)

It can scarcely be doubted, indeed, that a complete cure of the disease might, by a rigid plan of life, be accomplished in most cases, when the patients are not above the age of 30 or 35 years, even if they should already have experienced two or three paroxysms. In older habits, where the disease is of longer standing, a complete cure cannot be so confidently anticipated; but experience has shewn that the severity and the consequent evils of the disease may be effectually mitigated by temperance, even under such circumstances. It is a most dangerous and mistaken notion that the gout is to be encouraged; for its tendency is to increase in frequency, and in duration, to cripple the limbs, and to render the body liable to a variety of disorders, which tend to render life both shorter and more miserable than it would otherwise be.

The fear of the pernicious consequences of rigid temperance is an unfounded prejudice, very prevalent in this country; but if there be any danger, it can only originate in general from the fuddeness with which an extreme change is made. We have seen, in the case of the *Comte de Bellerive*, however, what a small quantity of nutriment is absolutely requisite for the wants of the constitution, and how beneficial even an extreme change of diet sometimes proves. (See CORRUPTION.)

The next point of management in the interval, which, together with temperance, conduces to the prevention of the recurrence of gout, is *exercise*. This tends to obviate plethora, on the one hand, by promoting the circulation and all the secretions, and to strengthen the stomach, on the other hand, and promote the function of digestion; and plethora and indigestion, as we have already stated, commonly precede the gouty paroxysm, and are connected with the gouty diathesis. By those who cannot walk, which is the best mode of exercise for the gouty, riding on horseback, or even in a carriage, should be substituted. Even friction, where these modes of exercise cannot be resorted to, may be an useful succedaneum. Dr. Cadogan's directions on this head are worthy of attention. If the patient "can neither walk nor ride at all, he must by degrees be brought to do

both by the assistance of others, which may be given him in the following manner: let a handy active servant or two be employed to rub him all over, as he lies in bed, with flannels, or flannel gloves, fomented with gums and spices, which will contribute greatly to brace and strengthen his nerves and fibres, and move his blood without any fatigue to himself. This may take up from five to ten minutes at first, but must be repeated five or six times a day, supposing him totally unable to help himself. But if he can walk a hundred yards only, it will forward him greatly to walk these hundred yards every two hours; and if he can bear a carriage, let him go out in it every day, till he begins to be tired. The first day or two all this may disturb and fatigue him a little; but if he has patience to persevere to the fourth, I dare promise him some amendment and increase of strength; which he must employ, as young merchants do a little money, to get a little more. Thus he must go on rubbing, walking, and riding a little more and more every day, stopping always on the first sensation of weariness to rest a little, till he be able to walk two or three miles at a stretch, or ride ten without any weariness at all." He must ever remember, however, that the habit of body is only to be corrected by habitual measures; and perseverance, therefore, must be his motto in regard to exercise, not less than with respect to temperance. But it must be observed, in general, that the exercise should not be violent; for if violent, it cannot be long continued, and must always endanger the production of atony and debility in proportion to the degree of violence. "It must be moderate," to use the words of Dr. Cullen, "but at the same time constant, and continued through life."

It has been supposed by some persons, that an abstemious and active mode of life for a limited time, as for instance, an abstinence from animal food and fermented liquors, and a diet of milk and farinaceous matters alone, for the space of one year, might be sufficient for a radical cure of the gout. Such an opinion was expressed by Celsus, who says that "some, by cleansing themselves thoroughly by drinking asses' milk, have for ever banished the disease; and others, by abstaining, during a whole year, from wine, mulse, and venery, have obtained a security from it for the remainder of their lives." (De Medicina, lib. iv. cap. 22.) In a few cases, this plan may possibly have succeeded; but it is well known that many persons, who, by entering on an abstemious course, had been delivered from the gout, have, on returning to their former mode of living, had the disease return with at least equal violence.

While an abstemious regimen, combined with exercise, will tend to correct the gouty habit, if steadily pursued; it will be at the same time advisable to avoid as much as possible some of those circumstances, which we have mentioned above as among the frequent exciting causes of the disease; more especially when the gouty habit has become established by a repetition of the fits, or is hereditary in its origin. In such cases, the measures, which we have proposed, are not easily pursued to the requisite extent, and are commonly attempted even with reluctance: men, therefore, have been very desirous to find a medicine which might answer the purpose, without requiring a restraint on their manner of living. Of this desire numerous empirics and self-interested pretenders have taken advantage, and have been induced either to amuse the gouty with inert medicines, or have rashly employed those of the most pernicious tendency. It is unnecessary for us to inquire into the nature of those ill-ged *spécifiques* nostrums, which, after being for some time in vogue, were neglected or exploded, as their inutilty or injurious qualities were thus acknowledged. But after promising that

we are much disposed, with Dr. Cullen and others, to believe the impossibility of curing the gouty habit by medicines, we shall notice one or two known medicines, which have been in vogue no long time ago. If the gouty constitution is created by a series of high-feeding and indolence, how is it to be expected that medicine can change that constitution, especially while the cause continues to operate?

The *Portland powder* is a medicine which obtained considerable reputation, as a cure for the gout, about the middle of the last century. This powder derived its name from the duke of Portland, who received so much relief from it, that he ordered the formula to be printed, and delivered to all who should ask for it. It was brought from Switzerland by a friend of the duke's. The powder consists of the roots of aristolochia rotunda and gentian, and of the tops and leaves of germander, ground-pine, and centaury, well dried and powdered, equal weights. This powder was ordered to be taken for a year or two, at first in the dose of a drachm daily, but afterwards in smaller quantities. (See Medical Obs. and Inquir. vol. i. art. 14.) In the work just referred to, Dr. Clephane has shown that a similar composition was used by the ancients for the cure of gout. Such a formula is given by Galen, in his treatise De Antidotis, lib. ii. cap. 17., which he says he had used himself. Celsus Aurelianus speaks of similar medicines, under the denomination of *analia medicamina*, from their being taken for the space of a year. Aëtius gives, among other gout medicines, an "antidotus podagrica ex duobus centaureæ generibus," which differs from the Portland powder in one ingredient only. But several of the ancients considered the long uninterrupted use of these medicines as dangerous; and assure us that they are extremely hurtful in the hot and bilious, and are only proper in cold and phlegmatic constitutions. The Portland powder has fallen into neglect, under a notion that it was ultimately prejudicial. "In every instance," says Dr. Cullen, "which I have known of its exhibition for the length of time prescribed, the persons who had taken it were indeed afterwards free from any inflammatory affection of the joint: but they were affected with many symptoms of the atonic gout; and all, soon after finishing their course of medicine, have been attacked with apoplexy, asthma, or dropsy, which proved fatal." (First Lines, par. 557.) Dr. Heberden, however, is of opinion, that the popular prejudices against this medicine at present are as far beyond the truth, as they formerly were in its favour. (Comment. p. 48.) He attributed to it considerable powers of alleviating the disease, by strengthening the stomach and supporting the function of digestion; and believes that many of the evils (which, because they followed its exhibition, were imputed to its operation,) were in reality the consequences of the disease, and not of the remedy. That those cases, however, of apoplexy, &c., which, it is admitted, occur in gouty habits, would be probably accelerated, if not occasioned, by the use of a stomachic powder, while the full diet was continued, appears to be extremely probable: for the plethora must have been increased in proportion to the artificial increase of the digestive powers. We should, therefore, be disposed to conclude, that the constant use of such a medicine must be pernicious, unless it were combined with temperance in eating and drinking; and that, with such a regimen, it would in all probability be highly beneficial, if taken whenever the symptoms of indigestion should appear.

Another class of remedies has been employed in the interval between the paroxysms of gout, and in many instances with considerable alleviation to the disease, rendering the



the fits milder, and the intervals between them longer: we allude to the *antacids*; such as the alkalis, and absorbent earths. The nature of the chalky matter, produced in inveterate gout, which is an acid, and denominated lithic or uric acid, (being the same which is found in the urine and urinary concretions,) has led to the theory, that this acid, or its elements, is the morbid humour of the gouty; and therefore naturally suggested the idea of using alkaline medicines as remedies for the disease. And as acetous drinks are found to increase the gouty diathesis, and to increase the disordered state of the digestive organs; so alkaline medicines have been found to relieve the symptoms of indigestion, and at the same time to lessen the disposition to gout. Thus the caustic alkalis have been found beneficial; but not more so, we believe, than the mild or carbonated alkalis, especially potash; and the absorbent or alkaline earths have likewise afforded relief, and sometimes speedily removed some of the urgent symptoms of disordered stomach; especially the preparations of chalk, lime-water, and magnesia. The magnesia is perhaps one of the best medicines of this sort for the gouty, as it not only corrects the acidity of the stomach, but at the same time is laxative to the bowels, and thus contributes to obviate plethora. When these antacids do not sufficiently open the bowels, or do not prevent costiveness, a little rhubarb, aloes, or some other aromatic purgative should be conjoined with them. It appears, from some experiments made by Mr. Home and Mr. Brande, and recently published in the Philosophical Transactions, (Part I. for 1810) that magnesia has a much more powerful influence in preventing the formation of the uric acid, in the urine, than any of the alkalis; it is probable, therefore, that it may be more beneficial in the gout. As a warm laxative the tincture of guaiacum was much recommended, and as it combines a stimulant with an evacuant property, it may be serviceable in some constitutions.

*Cure of the irregular Gout.*—We have already remarked, that false theory has led to much false alarm, and doubtless to many mistakes in practice, especially relative to the atonic gout; all the various symptoms of dyspepsia, and hypochondriasis being often supposed to be gouty, when no actual gout had ever appeared. Hence fomentations, blisters, rubefacients, and other local stimulants to the extremities, the Bath waters, hot pediluvia, &c. have been employed to bring on the gout in the feet, instead of relying on the remedies which might restore the functions of the digestive organs. The Bath waters are certainly to be recommended in those cases, as they are possessed of considerable powers in restoring the healthful condition of the stomach, especially when it has been disordered by irregular and intemperate living; and of relieving those wandering pains, which are deemed gouty, but which, as Dr. Heberden observes, are the common accompaniments of declining years and a broken constitution.

In these cases of atonic or wandering gout, as it is called, all the means usually employed to strengthen the habit in general, and the stomach in particular, are to be resorted to. Moderate, but frequent and regular exercise on horseback, or walking, must be pursued; the diet should be a little more generous, and some wine may be necessary; but both food and drink of the acetous kind must be shunned, and if wine, of whatever sort, should be found to increase the acidity of the stomach, spirits much diluted with water should be substituted. At the same time, for the purpose of supporting the tone of the stomach, preparations of iron, the Peruvian bark, bitters, and aromatics in moderation may be resorted to; and laxatives, employed only so as to prevent costiveness, must be taken. The propriety of frequent gentle

venies, where the indigestion is troublesome, is more than problematical; for, while they give a temporary relief, by removing a load of undigested food, they tend to debilitate the organ, and thus to increase the evil which they were intended to remove. At the same time, all the causes of debility formerly mentioned, must be shunned, and exposure to cold especially must be carefully avoided: the most certain means of doing this is by repairing to a warm climate during the winter season.

*Cure of misplaced or retrocedent Gout.*—This, like the atonic gout, are in a considerable degree the bugbears of medical speculation, more especially the misplaced gout; they do, we believe, occasionally occur in cases of old and inveterate gout, but certainly much more rarely than is generally believed. This opinion Dr. Heberden states from his own experience. (Comment. p. 41—See also "Lectures on the Cause and Treatment of Gout," by Dr. Robert Hamilton, Lynn, 1809.) The last mentioned physician, who had employed bleeding and other antiphlogistic remedies, both upon himself and several of his friends for eighteen years, never saw any thing like a retrocession of gout; and Dr. Cullen never saw an instance of misplaced gout.

When the gout has disappeared in the extremities, the stomach and bowels are sometimes attacked with most acute pain, which is of a spasmodic nature, and to be relieved only by strong diffusible stimulants, and opium in full doses. Opiates are doubtless the most effectual antispasmodics; but their operation will be aided by combining with them the ethers, volatile alkali, the free use of strong wines, and aromatics, given warm, or ardent spirits, if these are not essential. Camphor, musk, assafetida, and other strong smelling substances, may be employed as adjuvants, especially in the violent cases. External heat to the region of the stomach, hot pediluvia, or the warm bath, will contribute by their stimulant powers to overcome the spasms and pain. If the stomach is known to be loaded, as by a previous repast, its contents may be evacuated upwards, by draughts or warm water, with wine, or of chamomile tea, or downwards by means of some of the cathartic tinctures, as of rhubarb or rhubarb.

As those persons, who are subject to paroxysms of the gout, are generally plethoric in their habits, so they are liable to inflammatory diseases; and it can be doubted, that ordinary attacks of inflammation of the lungs, pleurisy, and apoplexy, have been deemed gouty, and have proved fatal from the omission of blood-letting. When the symptoms are pleurisy, or peripneumony, or the acute pleurisy, or erysipelatous tumour, threatening apoplexy, or the cerebral symptoms of apoplexy and palsy occur, we might be tempted to delay the exhibition of the usual remedies for these diseases, or be indeed to be sparing in the use of the lancet, because we apprehend a gouty diathesis; for doubtless being reduced in a few minutes. And, as Dr. Heberden justly observes, "where the danger is imminent, from the violence of the symptoms, and where doubtful whether they be gouty or inflammatory, we incur much greater risk by omitting blood-letting in a disease arising from inflammation, than by drawing blood in a disease arising from gout." Indeed these very physicians, who condemn bleeding and other evacuations in gout, in the extremities, gradually prescribe the prompt administration of these remedies, when the lungs, head, or other viscera are attacked with it. In a word, when the internal viscera are affected with unequivocal symptoms of inflammation, the same treatment by local and general evacuation, blistering, &c. must be resorted to, as in all other cases of inflammation, regard being had at the same time (an observation, indeed, which applies to the practice of medicine

universally) to the peculiar circumstances of the patient's age, strength, and constitution.

**GOUT-WORT**, in *Botany*. See **ANGELICA**.

**GOUTIER**, **GÔTRE**, or *Gôître*, terms in *Surgery*, applied to a chronic enlargement of the thyroid gland. See **BRONCHOCÈLE** and **GÔTRE**.

**GOUTY-LAND**, in *Agriculture*, a term used by the farmers to denote a hollow fuzzy black earth, with little springs, that have no free outlet, and therefore swell and elevate the surface in many places.

**GOUEVA**, in *Geography*, a town of Portugal, in Estremadura; 20 miles S.E. of Viseu.

**GOUX DE LA BOULAYE**, **FRANCIS LE**, in *Biography*, a celebrated traveller, was born in the province of Anjou about the year 1610. Little is known of his early life, but that he felt a strong propensity for rambling into foreign countries; he employed ten years successively in travelling various parts of the globe. He seems to have been willing to become all things to all men, in order to obtain his wishes in safety. In Africa and many parts of Asia he passed for a Mahometan, and in Europe he was a good Catholic. On his return, he published an account of his travels, under the title of "Les Voyages des Observations de François de la Boulaye le Goux, en divers Pays, d'Europe, d'Asie, et d'Afrique, jusqu'à l'Année 1650." This work was published in 4to. and illustrated and adorned with engravings. The style is incorrect, but the facts, as far as they are borne out with truth, are said to be very curious. He was so much altered in his person during his absence from France, that his mother even, either could not, or would not recognize him, and he was obliged to institute a law-suit to establish his rights as heir in the family. In 1668 he was appointed ambassador to the Porte and the great mogul, by Lewis XIV. who was very desirous of renewing his commerce with the East. Le Boulaye died in Persia of a fever before he had executed this mission. Moreri.

**GOUYE**, **THOMAS**, was born at Dieppe in the year 1650. He was brought up among the Jesuits, and was at an early period distinguished by an ardent love for mathematical and scientific pursuits. In 1699 he was elected a member of the Royal Academy of Sciences at Paris, of which body he became an assiduous attendant, and was highly esteemed for the useful contributions which he made to their memoirs. He died at Paris in 1725, leaving behind him, as memorials of his learning and industry, "Physical and Mathematical Observations tending to the Improvement of Astronomy and Geography, sent from Siam to the Academy of Sciences at Paris, by the Jesuit Missionaries, with Reflections and Notes, in two volumes." The first volume was published in 1688, the second in 1692, and both have been inserted in the seventh volume of the collections of the Academy. Moreri.

**GOW**, in *Geography*, a town of Hindoostan, in Bahar; 40 miles S.S.W. of Bahar. N. lat. 25. E. long. 54 48'.

**GOWER**, **JOHN**, in *Biography*, an ancient English poet of the fourteenth century, is said to have been descended from a family at Sutenham in Yorkshire. He had the best education which the times afforded, and at a proper age became a member of the society of the Inner Temple, where he attained to a high degree of respectability in the profession of the law, and where he became acquainted with Chaucer. Some writers affirm that, in the course of his professional duties he was appointed chief justice of the court of Common Pleas, though others think the judge was another person of the same name who was a contemporary with the poet. Gower attached himself to the duke of Gloucester, uncle to

Richard II., and was much noticed by the king himself, at whose desire he wrote his principal work. He had, however, a pliable mind, and could turn his pen to different interests; for on the accession of Henry IV. he not only wrote in adulatory terms to the new king, but even reflected on the mis-government of the one who had been deposed, and who had been his patron. His circumstances were such as to put him beyond the fear of want, for he appears to have been a liberal contributor to the rebuilding of the church of St. Mary Overy in Southwark. During the first year of Henry's reign, our poet had the misfortune to be deprived of his sight, an affliction which he did not long survive. He died in the year 1402, at a very advanced age. Gower, says his biographer, is entitled to a place among English writers only relatively to the time in which he flourished; for though well furnished with learning, and a successful cultivator of his native language, he has not the least pretensions to genius or invention. He is characterized by his friend Chaucer, as the "moral Gower;" he was uniformly grave, even upon topics that might inspire vivacity. He was author of three volumes, entitled "Speculum Meditantis;" "Vox Clamantis;" and "Confessio Amantis." Of these, the first is a moral tract, and relates to conjugal duties; the second is a metrical chronicle concerning the insurrection of the people under Richard II., in Latin elegiac verse: the third, or "Lover's Confessions," relates to the morals and metaphysics of love. This is the only one that has been printed, and it was among the earliest products of the English press, by Caxton in 1483. It seems, says Mr. Warton, to have been his object to crowd all his erudition into this elaborate performance. The most interesting part of the work is a variety of stories adduced as moral examples, and taken from authors most in vogue, ancient and modern. The language is perspicuous, and the versification frequently harmonious. Biog. Brit. Warton.

**GOWER**, in *Geography*, a district of Wales, in the south-western extremity of Glamorganshire, below the town of Swansea, and bounded by the Irish sea and the Bristol channel.

**GOWER**, *Cape*, a cape on the E. coast of China, lying in the track from the southward to the gulf of Pekin. A reef of rocks runs out from a neck of land near this cape, which appeared to have a compact harbour. The entrance to it was between the cape and the reef just mentioned. When the persons concerned in the embassy to China passed this cape, a considerable number of vessels were decried in the harbour, and a pretty large town behind it. N. lat. 36° 57'. E. long. 122° 15'.

**GOWER'S ISLAND**, a small, flat, low island, in the Pacific ocean, so called by captain Carteret, who passed it in August 1767; he found no anchorage, and could only obtain a few cocoa-nuts in exchange for nails; the inhabitants resembled those of Egmont isle. S. lat. 7 56'. E. long. 158° 56'.

**GOWER'S HARBOUR**, a bay on the S. W. coast of New Ireland; 5 miles N. of cape St. George. M. Bougainville calls this "Praeslin Bay," and by Dampier it is called "St. George's bay." S. lat. 4 50'. E. long. 150° 48'.

**GOWGAT**, a town of Hindoostan; 12 miles W. of Agra.

**GOWGATCHY**, a town of Bengal; 12 miles N. of Calcutta.

**GOWN**, **ROBE**, a long upper garment, worn by lawyers, divines, and other graduates, who are hence called *gentlemen of the gown*, or *gown-men*.

The gown is an ample sort of garment, worn over the ordinary

ordinary clothes, hanging down to the feet. It is fashioned differently for ecclesiastics, and for laymen.

At Rome, they give the name *virile gown*, *togas viriles*, to a plain kind of gown, which their youth assumed when arrived at puberty. This they particularly denominated *prætexta*.

In some universities, physicians wear the scarlet gown. In the Sorbonne, the doctors are always in gowns and caps. Beadles, &c. wear gowns of two colours.

Among the French officers, &c. they distinguish those of the short gown, or robe; which are such as have not been regularly examined. They have also barbers of the short gown, who are such as are obliged to practise in an inferior way to surgeons, or those of the long robe.

Gown is also taken, in the general, for the civil magistrature, or the profession opposite to that of arms.

In this sense it was that Cicero said, "Cedant arma togæ."

**GOWRAH**, in *Geography*, a town of Bengal; 27 miles S. S. E. of Doefa.—Also, a town of Hindoostan; 5 miles N. E. of Benares.

**GOWRAN**, a post town of Ireland, in the county of Kilkenny. It is a place at present of no importance, but was a borough before the Union, and there are some ruins which seem to intimate its former importance. It is 52 miles S. from Dublin.

**GOWREY**, a town of Hindoostan, in Oude; 53 miles W. of Kairabad.

**GOWRY-BIRD**, in *Ornithology*, a name given by Edwards to the *Loxia punctuloria*.

**GOWRYPOUR**, in *Geography*, a town of Bengal; 26 miles S. E. of Dacca.

**GOWT**, in *Engineering*, or go-out, is a name applied to the sea sluice, or valves used in embankments next the sea or tidal rivers, for letting out the land-waters when the tide is out, and preventing the ingress of salt-water. Some of the gowts in the fens of Lincolnshire and Cambridgeshire are very large works, and cost immense sums of money.

**GÓY**, in *Geography*. See **ANGOL**.

**GOYANES**, a town of Spain, in Galicia, on the sea-coast; 25 miles S. W. of Santiago. N. lat. 42° 32'. W. long. 8° 50'.

**GOYAS**, **GOIAS**, or *Goyaz*, a town and government of Brazil, extending from 42° to 54° W. long. and from 6° 30' to 19° S. lat. the inhabitants of which are estimated at 8930 whites, 29,630 Indians, and 34,100 negroes, who are employed in searching for gold in the mines, which were discovered in the year 1726.

**GOYAVA**, a town on the W. coast of the island of Grenada. N. lat. 12° 13'. W. long. 61° 31'.

**GOYAVES**, a town of the island of Guadaloupe, giving name to a bay in which it is situated.

**GOYEN**, **JOHN VAN**, in *Biography*, a painter, born at Leyden in 1596, who studied successfully the practice of landscape-painting under several masters, and having an uncommon readiness and skillfulness of hand, he produced a great many works of a light agreeable kind; with much character of nature, but no great relish of art; which, in their time, however, were very highly esteemed and widely spread over Europe.

Views of the scenes on the banks of the canals and rivers of the Low Countries were his favourite studies; sometimes he emerged to the sea shore, or sunk into the interior of the country, and sketched the villages that presented themselves to his taste in the one, or the harbours, &c. of the other; but all are touched by the same kind of pencilling, and

generally in the same hue of colour, when he came to work them up into pictures. Certainly, they have much merit of a peculiar kind, such as lightness in the handling, and freedom in their effect; but frequently they are rapid and flimsy, and by no means justify the high value and reputation affixed to them. It is said that the grey tone, too frequently found in his pictures, arose from the use he made of Haarlem blue, which is apt to fade into that tint, and therefore no longer in use. It may be so; but that grey is not the predominant defect in his pictures: it is the evident haste with which they are wrought, and their consequent imperfection of imitation, that induces us thus to condemn what the world have too long estimated in a high ratio, which ought only be given to works completed with the skill and purity of taste of a Caracci or a Claude. He died in 1656, aged 60.

**GOZ**, or **GOZEN**, in *Geography*, a sea-port town of Morocco, on the coast of the Atlantic, in the vicinity of Mogodor.

**GOZO**, an island of the Mediterranean, situated N. W. of Malta, and at a little distance from it. This island is about 25 miles in circumference, rather fertile, and containing about 3000 inhabitants.

**Gozo**, or *Gafila*, a small island in the Mediterranean, about 27 miles from the S. W. coast of Candia; anciently "Clauda," near which St. Paul sailed in his voyage to Rome. Some biblical writers suppose that the *Gozo* near the isle of Malta is the *Clauda* of the Book of Acts. It is occupied by about 30 families; who have a Greek church, and is occasionally visited by vessels for a supply of water and provisions. At a small distance to the west is a very little island called "Pulo Gozo," or Little Goz. N. lat. 34° 48'. E. long. 23° 46'. See **CLALDA**.

**GOZZANO**, a town of Italy, in the department of the Gogna; 18 miles N. of Novara.

**GOZZOLI**, **BENOZZO**, in *Biography*, one of the early practitioners of the art of painting on its revival. He was a Florentine, and disciple of Fra. Angeho; but subsequently imitated with very great success the style of Masaccio, his contemporary. Vasari speaks of him with great esteem under the name of *Benozzo*, and relates histories of his many productions at Florence, Volterra, Rome, and Pisa; at which latter place are his most conspicuous labours, both in history and portraits, which indeed at that time were usually introduced in historical pictures. At Pisa he died in 1478, aged 78, and a monument, with a Latin epitaph, is placed near his principal work in the Campo-Santo; a monument of his powers, and the esteem in which they were held.

**GRAAF**, **RENIER DE**, an excellent physician, was born at Schoonhove, a town in Holland, where his father was an eminent architect, on the 30th of July, 1641. He studied physic at Leyden, where he made great progress, and at the age of 22, published his treatise "De Succo Pancreatico," which gained him considerable reputation. In 1665, he went to France, and received the degree of M. D. at Angers; but he returned to Holland in the following year, and settled at Delft, where his great success in practice excited the envy of his professional brethren. He married in 1672, and died in August, 1673, when he was only 32 years of age. He published three dissertations relative to the organs of generation in both sexes, upon which he had a controversy with Swammerdam. His works were published in Svo. at Leyden, in 1677 and 1705; they were also translated into Flemish, and published at Amsterdam in 1686. Hutchinson, *Biog. Med. Eloy*.

**GRAAF REYNET**, in *Geography*, a district of southern Africa,

Africa, in the colony of the Cape of Good Hope, extending to the eastern extremity of the colony. On the E. it is divided from the Kaffers by the Great Fish river, the Turka, the Bambarberg, and the Zauereberg; on the W. from the districts of Zwelendam and Stellenbosch by the Cantoos river, the Camka or Lion's river, and Nieuwveld mountains; on the N. from the Bosjesman Hottentots by Plattenberg Landmark, the great Table mountain, and the Karreeberg; and on the S. it is terminated by the sea-coast; the whole length and breadth of this district may be about 250 by 160 miles, making an area of 40,000 square miles, which is peopled by about 700 families, each family commanding about 57 square miles of territory. Great part of it has been occasionally abandoned on account of the incursions of the Kaffers and Bosjesmans. The inhabitants are a sort of Nomades, who would long ago have perished with their flocks, and herds far beyond the present boundaries of the colony, if they had not been rescued by the Kaffers. The boors of this district are graziers; and it is entirely composed of loan-farms, which were grants made to the original settlers of certain portions of land to be held on reasonable yearly leases, on condition of paying to government an annual rent of 24 rix-dollars. *Barrow's Travels in S. Africa*, vol. ii.

GRAAT, or GRAET BARENT, in *Biography*, an historical painter, whose name is remembered principally upon account of his close imitation of the works of Bamberccio, and of his having founded an academy at Amsterdam, where he was born, to which the best artists of his time resorted to study after living models; by which means much improvement was obtained, and spread among those who cultivated taste and science in the arts. He died in 1709, aged 81.

GRAB, in *Geography*, a town of Bohemia, in the circle of Leitmeritz; 17 miles W. N. W. of Leitmeritz.

GRABATARI, GRABATARI, in *Church Antiquity*, such persons as deferred the receiving of baptism till the hour of death; or who did not receive it till they were dangerously ill, and out of hopes of life: from an opinion, that baptism absolutely washed away all former sins.

The word is formed of *grabatum*, *bed*; and that from the Greek *γὰρ*, *a hanging bed*, of *νῆπιος*, *I suspend*: such as was the bed of slaves, poor people, Cynic philosophers, &c. who are enemies of luxury and ease.

GRABAU, in *Geography*, a town of the duchy of Warsaw; 12 miles S. of Kalish.

GRABAW, a town of Austrian Poland, in the palatinate of Belez; 28 miles N. W. of Belez.

GRABE, JOHN ERNEST, in *Biography*, a learned divine, and editor of the Alexandrian manuscript, in the Royal Library at London, was born at Königsberg, in Prussia, in the year 1666. Here he received his education, and in due time took his degree of M. A. applying himself with all diligence to the study of divinity, and the perusal of the fathers. He had been brought up in the Lutheran principles, but having imbibed some notions inconsistent with the commonly received faith, respecting the uninterrupted succession of bishops being essential to the existence of the true church, he was summoned before his superiors and imprisoned. Upon his release, after a few months, he chose rather to quit the church than abandon his opinion, and determined to become a member of the Catholic religion. He delivered, in a memorial to the electoral college at Sambia, in Prussia, in 1695, containing the reasons for his change, and then left Königsberg, that he might be at liberty to carry his plan into execution, in some place where he should be beyond the reach of the

Prussian jurisdiction. While he was on the road to Erfurt, through which he went to pass to a Catholic country, the elector of Brandenburg sent three treatises to him in answer to his memorial, by three Prussian divines, written by order of the elector. This great attention of his sovereign claimed the respect of Grabe, who not only read them with care, but felt desirous of defending the question more closely before he formed his ultimate determination of abandoning the religion in which he had been educated. He accordingly wrote to one of the persons that had answered his memorial, intimating a strong wish to return to Berlin, that he might enjoy the benefit of a conference with him. This privilege was obtained for him; M. Grabe returned and was soon prevailed on to relinquish his purpose of joining the papal communion, but still he maintained the obnoxious tenet for which he had suffered imprisonment. Finding him immovable on this point, his friend advised him to remove to England, where, said he, "you will find the outward and uninterrupted succession which you want: take then your route thither: this step will cause less uneasiness to your friends, and, at the same time, equally satisfy your scruples." He gladly complied with the advice, and was strongly recommended to king William, who immediately granted him a pension of 100*l.* per ann. to enable him to pursue his studies. From this time he considered England as his country, because he conceived that its ecclesiastical constitution approached nearer on the whole, than that of any other, to the primitive pattern. He shewed his gratitude for the liberal patronage which he received by the publication of several learned works. Having formed a design of printing some curious and scarce pieces of the fathers, in defence of his own opinions, he obtained access to the university of Oxford, to examine the treasures of the Bodleian library, and, in 1698, he published "Spicilegium S. S. Patrum, &c." vol. 1. 8vo.; and in the following year, the second volume of the same work appeared. Shortly after this, he was ordained a deacon of the church of England, and was appointed chaplain of Christ-church, Oxford. This promotion he accepted, in order that he might be entitled to the emoluments without being required to discharge the duties of the appointment, for he had refused, on his ordination, to receive the sacrament, on account of the omission of the prayer in the communion service, mentioning the sacrifice, before the elements were distributed, which had been inserted in the first common-prayer book of king Edward VI., and he ever afterwards continued a non-conformist in this particular. In the same year in which he took orders, Mr. Grabe published "S. Justinii Philosophi et Martyris Apologia Prima pro Christianis, &c." illustrated with the notes of several learned men, and additional remarks of his own; and in 1702 he published "S. Irenaei Episcopi Lugdunensis contra omnes Hæreses Libri quinque, &c." with prolegomena and notes. On the accession of queen Anne to the throne, Mr. Grabe's pension was continued, and her majesty was advised to employ him in printing the Alexandrian MS. in the royal library, of the Septuagint translation of the Old Testament. The queen took the opportunity of informing him of the appointment herself, and at the same time made him a handsome present as an encouragement to his exertions. In 1705, he published proposals for printing that work by subscription, setting forth the superior value of this copy to the Vatican MS.; he also gave three specimens, containing so many different methods for the projected edition, in the final choice of which he was to be determined by the learned world. As a testimony of their approbation of the design, the university of Oxford pre-

mented him with the degree of doctor of divinity. His proposals met with a very favourable reception on the continent as well as in England, and he received a handsome present from his own sovereign, the king of Prussia, and liberal subscriptions from the principal nobility, clergy, and gentry of all parts. In 1707, he gave to the public his first volume, under the title of "Vetus Testamentum juxta Septuaginta Interpretes; tom. 1. continens Océateuchum." This volume contains the Pentateuch, and the three following books. In the expectation of an accession of additional MSS. he deferred the second and third volumes, and published the fourth volume in the year 1709. This contained the book of Psalms, of Job, of the three books of Solomon, &c; and in the following year he published a Latin dissertation, giving a particular account of the reasons why he had departed from the usual order of publication, and of the helps which he expected to receive in order to perfect his plan. These were, a Syriac MS. of the historical books of the Old Testament, with Origen's remarks upon them, and two MSS. one belonging to cardinal Chigi, and the other to the college of Lewis XIV. When he received these MSS. and had collated them, he prepared a volume of annotations on the whole work, and collected materials for the Prolegomena. The time which these objects took, caused a material delay in the publication of the second and third volumes, which did not, in fact, appear till after the author's death. This event took place in 1712, when he was only in the forty-fifth year of his age. He had previously to this published "An Essay upon the Arabic MSS. in the Bodleian library, and that ancient book, called the Doctrine of the Apollon, which is said to be extant in them, wherein Mr. Whiston's mistakes about both are plainly proved." The third volume of his great work was published in 1719, and the fourth in 1720. On his death-bed he was attended by Dr. Smalridge, by whose means he desired that the public might be informed that he died in the faith and communion of the church of England, though he considered its constitution to be defective in some points, in which he thought the nonjuring clergy adhered more closely to the apostolical doctrine and discipline. Of his talents there were different opinions, but of his industry and learning no one could harbour a doubt. Dr. Thirlby says, in the dedication of his edition of Justin's Apology, "he was a good man, and not unlearned, and well versed in the writings of the fathers. But he was no critic, nor could be one, since he was not furnished with genius or judgment, or, to speak the truth, with learning sufficient for the purpose." In this opinion Le Clerc coincides, and adds, that his books gained him the character of a laborious person rather than that of a great critic. He was the author of many other works besides those which have been mentioned, and was editor of an elegant edition of bishop Bull's works: he likewise assisted in preparing for the press archdeacon Gregory's edition of the New Testament in Greek; and he left behind him many MSS. some of which have been published. *Biog. Brit.*

GRABEN, in *Geography*, a town of Croatia; 12 miles S. of Varasdin.

GRABO, a town of Sweden, in East Gothland; 11 miles S. E. Linköping.

GRABON, a town of the duchy of Mecklenburg, on the Elbe; 80 miles N. W. of Berlin. N. lat. 53° 23'. E. long. 11° 44'.

GRABUSA, an island of the Mediterranean, near the N. W. coast of the island of Candy, confirmed to the Turks

by the peace of Carlowitz, and generally garrisoned with 1000 men. N. lat. 35° 40'. E. long. 23° 33'.

GRABUT, in *Biography*, an obscure French musical composer, whose name is not to be found in the annals of the art. He was brought into England to flatter the partiality of Charles II. for the music of France; and employed by Dryden to set his political opera of "Albion and Albanus," though Purcell had already given indisputable proofs of his superior genius, and was rapidly rising into fame and national favour.

This drama, written under the auspices of king Charles II., was rehearsed several times, as the author informs us in his preface, before his majesty, "who had publicly declared, more than once, that the compositions and choruses were more just and more beautiful than any he had heard in England." We believe this prince was not very skillful in music, nor very sensible to the charm of any species of it but that of France, of the gayest kind; however, royal approbation is flattering and extensive in its influence. Unfortunately for the poet and musician, his majesty died before it was brought on the stage; and when it did appear, the success seems not to have been very considerable. Upon a perusal of this drama, it seems hardly possible, to bear a revelation, that it should have escaped condemnation upon party principles; as, under obvious allegories, Dryden has lashed the city of London, democracy, fanaticism, and whatever else thought obnoxious to the spirit of the government at that period. Had Orpheus himself not only composed the poem and the music, but performed the principal part, his powers would have been too feeble to charm such unwilling hearers."

GRACAY, in *Geography*, a town of France, in the department of the Cher, and chief place of a canton, in the district of Bourges; 9 miles S. W. of Vierzan. The place contains 2204, and the canton 5459 inhabitants, on a territory of 145 kilometres, in 9 communes.

GRACCHURIS, an ancient town of Hispania Tarraconensis, mentioned by Livy, Ausonius, and Ptolemy, and said to be built by the prosperous Titus Gracchus Sempromius, after having conquered the Celtiberians. Others suppose that it existed before Sempromius, under the name of "Illureis," and that he only repaired it. It is now called Arreda.

GRACCHUS, TIBERIUS SEMPRONIUS, in *Biography*, a person very memorable in the history of Rome, was the son of a father of the same name, a distinguished commander, and excellent citizen, who, from the Plebeian ranks, arrived at distinguished honours, and the highest offices in the state, having been made master of the horse to the dictator, Junius, after the celebrated battle of Cannæ, and afterwards consul, and, at length, to complete his glory, he was slain while fighting for his country. The mother of the subject of this article was Cornelia, daughter of Scipio Africanus, whose character has been illustrated in the proper place. Tiberius received every advantage of education that the pious affection of a wise parent could bestow, and his natural disposition seconded the efforts of his instructors. He was modest, and remarkably mild in his temper; and became, at a very early age, distinguished for eloquence, sobriety, and political knowledge; and his reputation was fixed by an admission into the venerable college of augurs. It is mentioned, as a proof of the high character which he sustained, that Claudia Appia, one of the most illustrious persons in Rome, and president of the senate, offered him, in betrothment, his daughter in marriage, which he then finally accepted. When Appia informed his wife what he had done, she replied, "Why so suddenly, you might have taken

## GRACCHUS.

taken time, even if Tiberius Gracchus were the man." In conformity with the Roman custom, Tiberius passed his youth in military service; first in Africa, under his brother-in-law, the younger Scipio, where he obtained great credit in the army, being equally beloved by those above and those below him. He was made quæstor, in the Numantian war, to the consul C. Hostilius Mancinus. This was in the year B. C. 137: the campaign was unfortunate, and the Roman general was under the necessity of negotiating a treaty of peace with the enemy. The Numantines, who had been betrayed in a former treaty by the Romans, refused to negotiate, unless it were with Tiberius Gracchus, with whose character for probity and strict honour they were well acquainted. This being admitted, a peace was immediately concluded. The treaty, though as favourable as, from circumstances, could be expected, was received by the Romans with great indignation: they determined to annul it, and to deliver those, who had been instrumental in making it, into the hands of the Numantines. The consul was accordingly given up to them, naked and in chains, and it is probable that Tiberius Gracchus would have shared the same fate had not a powerful interest been exerted in his favour. A sense of the injustice of the senate on this occasion, and resentment of the dishonour they had thrown upon his treaty, was supposed to be a principal cause of the subsequent hostilities in which he engaged against that body. The condition of the Romans, at this period, afforded a good opportunity for the exertions of patriotism; for the great mass of the lower classes of citizens were in a state of abject poverty. Lælius the Wise, the friend of Scipio, had attempted to introduce some remedy for this evil, but the serious opposition of men in power had deterred him from the execution of his plan. Tiberius Gracchus resolved to take up the cause. He was accordingly elected a tribune of the people, and proposed a revival of the Licinian law, with certain modifications, which greatly softened its operation. (See AGRARIAN LAW.) It offered a full compensation out of the treasury for all the land above the 500 acres allowed, which any one might be obliged to resign to the public, and permitted every child of a family to hold 250 acres above the 500 held in the father's name. This proposal was received, as it might be expected, by the superior orders, whose rights and properties were to be affected by it: they were determined to stand by one another in resisting the innovation. On the other hand, Gracchus lost no time in rousing the people to a knowledge and assertion of their claims as men and members of society. His speeches were addressed to their interests and their feelings: his arguments were specious and highly dangerous to the peace of those whose wealth was become the object of popular discussion. In one of his harangues, he exclaimed, "The wild beasts have their caves and dens, but the brave men who shed their blood in the cause of their country have nothing free but the air and the light. It is a mere mockery when their generals exhort them to fight for their sepulchres and household gods, when, perhaps, not a man among them is possessed of a domestic altar, or sepulchre, of his ancestors. The private men bleed and die to secure the luxuries of the great, and they are denominated the masters of the world, while they are not owners of a foot of ground." At length, after much tumult in the state, the Agrarian law was passed, and Appius Claudius, Tiberius Gracchus, and his younger brother Caius, were appointed commissioners to carry its provisions into execution. In his progress in the business he was embarrassed with many obstacles, and, on his part, he took measures effectually to thwart the purposes of

the great; and, by new laws which he got enacted, he rendered the property of all the old families insecure. The difficulties which occurred in carrying the new law into effect were suspended by the death of Attalus, king of Pergamus, who made the Roman people his heirs. Gracchus procured a law for the distribution of his treasures among the poorer citizens, and for the disposal of the revenues of Pergamus, not by the senate, but by the assembly of the people. These measures gave him a great degree of influence among the citizens, and he conceived the design of securing the powers of which he felt himself possessed, by raising his father-in-law to the consulate, his brother to the tribuneship, and continuing to himself the same office another year. He also planned other regulations for abridging the authority of the patricians, and throwing more weight into the popular scale. The day of election was approaching, and the senators resolved to make a stand against the innovations which he proposed, and a conspiracy was openly formed to take away the life of Tiberius Gracchus. Of this he was informed by a friendly senator, as he was proceeding to the capitol. He, nevertheless, advanced, and his party prepared to repel force by force. In the uproar, he attempted to speak, but his voice could not be heard. He made signs to his friends, by raising his hand to his head, to shew that his life was in danger. This signal was instantly interpreted by his enemies as a demand of the regal crown, and Scipio Nasica, the inveterate enemy of Gracchus, cried out "Since we are betrayed by our consul, let those who love the republic follow me." A general contest now commenced. The adherents of Gracchus were quickly dispersed, and himself was dispatched with a thousand blows. Not less than 300 persons were slain in this commotion, and the bodies of the dead, even that of Gracchus himself, were ignominiously thrown into the Tiber. Several of his friends were afterwards banished, and not a few put to death, without the form even of trial, and the senate passed an act of indemnity for all those who were concerned in the massacre. The people, however, indignant against his enemies, drove Nasica from Italy, and would never permit him to return. With respect to Tiberius Gracchus, his character has been celebrated either as that of a martyr to liberty, or as a victim to lawless ambition, according to the different principles of those who have commented on his actions. Many have thrown on his memory reflections as unmanly as they are severe. It seems to be acknowledged on all hands that he possessed great talents, and was esteemed for his private worth. That he was a man of ambition none will deny, and it may be that a love of popularity suggested the great measures which he proposed; nevertheless, the historian may be safely followed, who says, that he was actuated by the best intentions, but that he prosecuted his design with too much violence.

GRACCHUS CAIUS, brother to Tiberius, but his junior by nine years, enjoyed the same advantages of education with his brother, which he so well improved as to become one of the ablest orators of his time. Cicero says of him, that he knows not if he had his equal in eloquence, and recommends his compositions, though unfinished, to the study of youth. After the tragical end of his brother, Caius passed some time in retirement, cultivating his rhetorical talents, and secretly preparing to act his part on the theatre of the public. In the year 126 B. C. he accompanied the consul Aurelius Orestes to Sardinia as his quæstor, and obtained great applause, as well for his humanity and temperance, as for a strict attention to the duties of his office. The senate shewed evident signs of jealousy on account of the



the popularity which he acquired, and retained him as pro-  
 quellor in Sardinia in order to keep him at a distance from  
 the Roman forum. Perceiving their intentions, he ventured,  
 in defiance of their orders, to quit the island without leave  
 of his commander, and suddenly made his appearance at  
 Rome. He was called to account for this breach of military  
 discipline, but was readily acquitted. Soon after he became  
 a candidate for the tribuneship, and such was the zeal of the  
 people in his favour, that the Campus Martius was not able  
 to contain the multitude who flocked from the Italian towns  
 to support his election, and many gave their votes from the  
 tops of the adjacent houses. Caius had not forgotten the  
 enemies of Tiberius, and would have pursued them to their  
 destruction, but was probably dissuaded from it by his mother.  
 His speeches were calculated to revive the indignation of the  
 people against the senators for their conduct towards Tibe-  
 rius, and he proposed and carried motions for confirming his  
 brother's laws, and the passing of others still more obnoxious  
 to the patricians. He was appointed commissioner for the  
 division of lands among the poor citizens and allies, and in  
 his progress through Italy he employed his talents and  
 wealth in repairing roads, building bridges, and in other  
 works equally useful and important. He established public  
 granaries in Rome, from which the citizens were to have  
 their monthly distributions of corn at a low price, the ex-  
 pences of which were to be defrayed by duties laid on goods  
 imported into the dominions of the late king Attalus. By  
 these, and other acts of a like kind, he so ingratiated him-  
 self with the people, that he was chosen a second time  
 tribune. Triumphant in his success, he proposed a law for  
 transferring from the senators to the knights the cognizance  
 of all private causes. When he had obtained his purpose he  
 exclaimed, "at length I have humbled the senate." He  
 now felt himself the arbiter of the republic, and treated the  
 patricians with contempt. This behaviour hastened his  
 ruin. There is a point, beyond which the most successful  
 man, whatever be his pretensions, cannot go with safety.  
 Caius had transgressed this boundary, and his enemies were  
 perpetually on the watch for opportunities to check his  
 power, and to introduce rivals who might, by the appear-  
 ance of more liberality, depreciate his reputation and influence  
 in the state. During his absence in Africa his enemies  
 were ever on the alert to injure his fair fame, and to ascribe  
 unworthy and base motives to all that he did or proposed to  
 do; and in the tumult which accompanied the discussion of  
 some of his laws after his return, he fled to the temple  
 of Diana, and, unwilling to sacrifice either himself or his  
 adherents to popular fury, he proposed terms of accommoda-  
 tion. These were rejected by the arts of Opimius the  
 consul, and a price was instantly set upon the heads of  
 Gracchus and his friend Fulvius. A formal battle ensued,  
 in which multitudes were slain on both sides, and the popu-  
 lace without hesitation deserted their friends: Fulvius con-  
 cealed himself, but, being discovered, was instantly killed.  
 Gracchus, having solemnly imprecated upon the heads of the  
 Roman people perpetual slavery for the base desertion of the  
 cause, left the city and passed across the bridge named Sub-  
 licius. His retreat was favoured by two faithful friends, who  
 defended the bridge till they fell covered with wounds. In  
 the mean time Gracchus reached a grove sacred to the furies,  
 where it is said a slave, by his order, first dispatched him, and  
 then put an end to his own life. Others have, however,  
 given a different account of the matter; they say that he  
 was overtaken by his enemies, and by them slain. His  
 head was cut off and sold to the consul for its weight in gold.  
 The body was thrown into the Tyber, but afterwards being  
 taken from the water it was delivered to his afflicted mother

for burial. This catastrophe, in which three thousand per-  
 sons perished, happened in the year 121 B. C., and the senate  
 immediately proceeded to abolish all the laws of the Gracchi.  
 Their names, however, were still fondly cherished by the  
 people, statues were erected to their memory, and the places  
 in which they were killed were consecrated, by religious  
 rites, to their manes. Caius has been generally considered as  
 less pure in his intentions, and less moderate in his plans, than  
 Tiberius. From the evidence of history it should seem, that  
 the disturbance of the public tranquillity was rather owing to  
 his opposers than to him; "so that," says the historian,  
 "instead of calling the tumults of that period the 'sedition  
 of the Gracchi,' we should rather call them the sedition  
 of the senate against the Gracchi, since the efforts of the  
 latter were made in vindication of a law, to which the se-  
 nate had assented, and as the designs of the former were sup-  
 ported by an armed power from the country that had never  
 before interfered in the business of legislation, and the in-  
 troduction of which gave a most irrecoverable blow to the  
 constitution. Caius in his person was graceful, his action  
 was strong and impressive, his voice of great compass and  
 melodious when the vehemence of his pleading did not raise  
 it to too high a key; to correct this defect he was accustom-  
 ed to place a judicious person behind him with a pitch-pipe, by  
 which he was enabled to regulate his tone. In temper he was  
 warmer than Tiberius, nor was he distinguished by sobriety  
 of manners, though in this respect he might be advantageously  
 compared to the Roman youth in general. Platarch.  
 Univ. Hist.

GRACE, GRATIA, χάρις, in *Theology*, denotes in general  
 any gift or favour, which God *freely* bestows upon mankind;  
 whether such gift pertains to the present or future life: but  
 as those which relate to the improvement of their temper,  
 and their fitness for final happiness, were favours of the  
 greatest importance, this term is by way of eminence  
 applied to them. The proper signification of the word *grace*  
 is favour;—favour in such a sense as denotes mercy and  
 goodness in a superior, either remitting somewhat of his own  
 right, or conferring somewhat beneficial upon others, *freely*  
 and without any obligation of debt. And because this may  
 be done in various modes and in a great diversity of instances,  
 hence the word *grace* in scripture is accordingly applied in a  
 corresponding diversity of significations. Sometimes it  
 signifies those extraordinary gifts and favours of the Holy  
 Ghost, by which the apostles were enabled to demonstrate  
 the truth of their commission, to preach their doctrines with  
 authority, to convince gain-sayers with evidence, and to gover-  
 n the churches by a proper distribution of different  
 trusts and offices. The gifts or powers, by which the apostles  
 were enabled to do all these things with extraordinary effica-  
 cy and success, are therefore called *grace*, because they  
 are not at all natural acquisitions but free gifts of God;  
 distributed to every one, not according to the will of man,  
 but at such times, and in such proportions, and to such per-  
 sons, and for such purposes as God himself pleased. See  
 Rom. i. 5. Ephes. iv. 7. 11.

In other passages, the same word is used to signify that  
 extraordinary assistance and support which God has been  
 pleased sometimes to afford to his servants under extraordi-  
 nary difficulties and trials; and this is called *grace*, because  
 it is considered as given particularly and gratuitously upon ex-  
 traordinary occasions over and above the general supports  
 arising from the considerations of reason, and from the promises  
 and motives of the gospel in general. See 2 Cor. xii. 9.

A third sense, in which the word *grace* sometimes occurs  
 in the New Testament, is to express such moral virtues as  
 are the effects of men's being influenced by the spiritual

motives of the gospel, and the practice of which preserves men in the favour of God, and recommends them to his gracious acceptance. (See Ephes. iv. 29 2 Pet. iii. 18. 2 Cor. viii. 1. 6.) Moral virtues are plainly for this reason distinguished by the denomination of grace, because they proceed from and are founded on a regard to God in general, and in particular to his will revealed under the gracious dispensation of the gospel of Christ.

Another signification of the word grace in Scripture is to express the merciful acceptance of repentance and amendment, by which God is pleased, not out of any obligation of justice, but in gracious goodness, to restore men to favour. In this sense Paul says (1 Cor. xv. 9.) "By the *grace* of God I am what I am:" so John, i. 17., the doctrine of Christ is styled "grace and truth." The Apostles' preaching is by St. Luke (Acts, xiv. 3.) called "the word," or declaration "of God's grace:" so when St. Paul declares (Rom. iii. 24.) that repenting sinners are "justified freely by grace," and blames those "who continue in sin, that grace may abound." The word grace in all these passages signifies that merciful and compassionate disposition of the divine nature, by which God freely remits of his right of punishment, and receives penitent sinners, upon more gracious terms, and to greater degree of his favour, than he was bound to do by any obligations of justice.

Hence it is, that the gospel itself, as being the great and standing declaration of God's mercy and goodness towards men, shewn forth in the free pardon and forgiveness of sin upon the gracious terms of repentance and amendment, is in the New Testament very frequently meant by the phrase, "the grace of God." (Clarke's Sermon. vol. ii. p. 265—275. 8vo. fol. ed. vol. i. p. 180, &c.) Bishop Pearce (Comm. vol. ii. p. 259.) renders *χαρις* in 1 Cor. x. 30. thanksgiving, and not grace, as it is in our version; and he observes that this sense of the word *χαρις* is too frequent in St. Paul's writings to require a proof of it. He adds that *ευχαριστω* in the latter part of the verse confirms this sense.

Some divines define grace to be any degree of divine influence on the mind, inclining it to believe in Christ, and to practise virtue; and those divine influences, which are not effectual in producing saving faith and sincere obedience, they call *common* grace, in contradistinction to *special* grace, the operation of which is completely efficient and saving; and those influences which introduce *special* grace, though they do not actually amount to it, are with respect to that introduction sometimes called *preparatory*. It is disputed among theologians whether special grace, which they suppose is never on the whole finally rejected, so as to fail of working faith in those who are the happy objects of it, be in the nature of its operations upon the human mind *irresistible* or not; and it is also questioned, whether common grace be *sufficient*. Whether the mind be entirely *passive* in the first moment of its conversion, or whether there be any co-operation of our own together with the influences of divine grace upon the heart, is a question, which has been also very much disputed amongst divines of a particular description; and another question, no less the subject of controversy, is similar to the former, and that is, whether the work of regeneration and conversion be accomplished in an *instant*. But we should far exceed our prescribed limits if we were to state the arguments *pro* and *con* on questions of this nature.

GRACE, in *Law*, is sometimes used for a faculty, licence, or dispensation; but this seemeth to be only in a case where the matter proceedeth, as it were, *ex gratia*, of grace and favour; and not where the licence or dispensation is granted of course or of necessity.

GRACE is also a term in the formula of all patents, &c. which begin, George, by the grace of God, king of Great Britain, &c. The Romish bishops frequently began their mandates in the like manner: such a one, by the grace of God, and the holy see, bishop of, &c.

The English archbishops say, by divine grace, or divine providence. See ARCHBISHOP.

All sovereigns use the phrase grace of God; as emperors, kings, princes, &c. Anciently dukes, counts, and even lords, talked in the same style. In the new collection of Father Martene we meet with a mere seigneur, or lord, qualified by the grace of God seigneur de Combourn. Louis XI. forbade the duke of Brittany to style himself by the grace of God.

GRACE is also a title of dignity, attributed to princes of inferior rank, and who are not qualified for that of highness.

In former times the kings of England were addressed under the title of grace, as they are now under that of majesty. See KING.

Our English dukes and archbishops are still addressed under the title of grace. But that title is most frequent in Upper Germany, and particularly Austria, where it is borne by the barons, as being inferior to that of excellence.

GRACE is also applied to persons, and various kinds of performances, to denote a quality, or rather the result of a combination of qualities, which attracts peculiar notice, and affords peculiar pleasure.

GRACE is also used for a short prayer offered before and after meat. This practice is very ancient, and has very generally obtained both in the heathen and Christian world: and hence grace-cup is used by some of our poets for the cup or health drank after grace.

GRACE, in the arts of *Painting* and *Sculpture*, is used to signify a peculiar quality which heightens the effect that beauty of form is calculated to produce, and renders it still more engaging.

We have already, in the article BEAUTY, slightly touched upon this subject, and there mentioned the origin of the term among the Greeks; who gave to the Charites or Graces, whom they deified, the presidency over whatever was amiable and engaging in the actions or sentiments of mankind. By the undiguised nakedness in which they always represented these goddesses, to whom they gave the names of Aglaia, Thalia, and Euphrosyne: they allegorized the pure sincerity and simplicity in which acts of kindness should always be wrought. By the union of these persons, which are gently holding each other by the hands, or with their arms round each other's necks, they marked the union of spirit which dictates acts of benevolence and social intercourse; and by devoting them to the service of Venus, exemplified the necessity of uniting the virtues of humanity to the beauties of person, in order to become truly engaging.

This allegory of the ancient Greeks leads us to the just conception of the meaning of the word grace when applied to the arts. Whatever can lend to beauty, increase of interell upon the beholder, is entitled to be called graceful, or at least elegant. (See ELEGANCE, in *Painting*.) As the heart of man, when inclined to good, is to his mental, so is grace to his personal accomplishments; that, which gives the most delightful gratification to those with whom he associates. Without it, art is nothing, compared with the values it acquires by its presence. Independent of all which constitutes mere beauty of form, it is absolutely necessary to give it its full force, its greatest effect, *viz.* that which

beauty acquires by motion, wherein alone grace is visible.

Poets as well as painters and sculptors acknowledge the value of this quality: and the best have constantly applied it to the objects of their adulation when moving. Milton says of Eve, "Grace was in all her steps." Ariosto adds it to perfect the beauties of his Alcina; when he says,

"Avea in ogni parte un lascivo tese  
O parli, o rida, o canti, o passo mova."

The graces, lurking about the mouth and the eyes of a beautiful person when in motion, are the most constant theme of poets, and as constantly the source of emulation to the painter and sculptor to imitate; and when the artist has by his ingenuity discovered and represented truly those minute variations of form which take place both in figure and features, when the mind is excited by some amiable emotion; he has obtained the ultimatum of his art; no power can go beyond it. Apelles, the ancient Greek artist of most repute, declared of his contemporaries, that their several works possessed every beauty but the perfection which grace alone can give: in this he found himself unrivalled. Ancient sculpture is fraught with it; their figures, whether in action or repose, possess it; and when we say that it may be found in figures reposing, we do not militate against the sentiment that action is the basis of grace; a previous motion being supposed to have taken place, to produce the graceful position. No figure, standing, sitting, or lying down, can be graceful, however beautiful it may be, whose parts or members are presented altogether straight and full to the eye. Without some varying turn being given to the head, the body, the arms, or the legs, it will be in vain to look for grace; and it is their being arrested in the action they may assume, at the most agreeable and expressive point of view, which gives the consummation of this invaluable quality to them. Then, if fixed for ever, they will be for ever graceful; and the delight which the contemplation of their mere beauty of form and proportion conveyed, will be heightened to the summit of that gratification which art is enabled to afford.

Wherein then lies this source of perfection? How, with certainty, may we express it in our works? is the hitherto unanswered query of the artist; or answered but in part and unsatisfactorily. All writers on painting have touched upon grace, and some have attempted to give information of the principles whereon it rests. Lamoza, in his *Trattato della Pittura* says, that Michael Angelo gave the following precept to Marcus de Sirena, his pupil. "That he should always make a figure pyramidal, serpent-like, and multiplied by one, two, three!" In which precept (Lamoza continues) in mine opinion the whole mystery of the art consisteth. For the greatest grace and life a picture can have, is, that it express motion. Now there is no form so fit to express motion as that of flame of fire." This text is again repeated by Du Fresnoy, and thus has Dryden translated the passage; "Large flowing gliding out-lines, which are in waves, give not only a grace to the part, but to the whole body, as we see in the Antinous, and in many other of the antique figures. A fine figure, and its parts, ought always to have a *serpent-like* and *flaming form*; naturally, those sorts of lines have I know not what of life and seeming motion in them; which very much resemble the activity of the flame and of the serpent."

On these two remarks our own industrious and skilful Hogarth has built a system, which, if it be not altogether compleat, has yet much sagacity and utility in it, and which he has given to the world in his *Analysis of Beauty*. He therein adopts the serpentine line, (which he illustrates by

supposing a wire drawn spirally round a cone from its base to its apex), as the basis of grace, with much apparent truth: and he is most certainly supported by all those fine works wherein gracefulness is acknowledged to reside. The Torso of the Belvidere, the Venus de Medicis, the Apollo Belvidere, the Laocoon, who, in the midst of the violent anguish he suffers, still possesses grace. All these, and indeed all others, which have any pretensions of the like kind, have the serpentine line for the base of their composition, in a greater or less degree. Who shall laugh at a system upheld by such authority! Walpole attempts to ridicule it, as well as others, because Hogarth was not equal to put it in practice. The futility of such an argument needs no illustration. To conceive a thing in the imagination, and not be able to exemplify it by practice, is by no means an uncommon occurrence among artists, or among men; yet the propriety of the conception may be unquestionable, taken on general grounds. Hogarth's mistake appears to have been, having fixed the boundary of grace; having given what he calls the *precise line* of it; whereas, all the antique figures mentioned above are graceful, while each varies from the other in the quantum of curve which its action consists of. Hence arises, that he so narrowed the sphere wherein grace was observable, which in nature is found to be so widely extended, that, without just consideration, his ingenuity was regarded as the ravings of eccentricity; whilst no good arguments were adduced to disprove the general principle, which appears to us to be just. How to employ it, is another question. And here we fear no rules will suffice to guide the practitioner in art. As we said of elegance, we repeat of grace: he that is endowed by nature with a power to feel its beauties, and display its effects, may, by cultivation, improve his original stock; but he that requires to be taught what grace is, will, in vain, seek to obtain the power of painting it; if he ever arrives at the knowledge of it, or the power of seeing it, in nature or in art. A constant observation upon the actions, in figure and feature, of those who are by nature graceful, is the best school in which to study it, and the readiest mode to discover wherein it lies.

Grace is not, or rather ought not, to be confined to the figures in a composition. Every part of the picture should have a conjunctive effect to produce grace in the whole. Contrast of form will aid the beauty of the principal parts, but that contrast should never force itself into notice, the artifice would then become apparent, and the eye would not be led to the beautiful parts, but, on the contrary, be detained from them. The painter therefore who has conceived a graceful figure, should either paint it singly, or be careful so to support it, by proper accompanying lines and objects, that its beauty be not lost in the mass, and its effect overpowered by other forms of less value becoming obtrusive to the observer. And great care should be taken to prevent every attempt to produce grace in the action of figures, from degenerating into affectation. Where that begins, grace ends: and detestation or ridicule, instead of admiration, becomes the meed of the artist! No vice in art is so odious as affectation! If the best executed work imaginable be unhappily tinged with it, few minds of an elegant or graceful turn of feeling will bear to dwell upon it. Those artists who allow their minds to be impressed with the passion or sensation they wish to convey in their figures, and thence conceive the action of them, are not so liable to fall into this error, as those whose ideas are more intent on making an agreeable picture, and think of the actions, before they have considered the passions of their figures. Raphael is an instance of the former; Correggio and Parmigianino

giano, great and graceful as they frequently were, nevertheless belong too often to the latter class, and even their extraordinary brilliancy of talent does not secure them from just censure when that is the case.

The best examples of grace are to be found in ancient sculpture and paintings, and in the works of Raphael. Some few of the works of Correggio, of Parmigiano, and of Guido Rheni, possess it, perhaps, more refined than Raphael's; but they are so near the extreme boundary wherein real unaffected grace resides, that they are dangerous exemplars to a student. A confirmed artist may observe them to advantage.

Sir Joshua Reynolds possessed it largely, and perhaps we ought to have added his name to Raphael's. But yet he is not always pure: a little too much of the Correggiefque is admitted in some of his fancy pictures; and particularly in the expressions of the features.

GRACE, *Act of*, properly denotes an act of amnesty, or oblivion, for the pardon of all offenders who are qualified, or come within the conditions of it.

The term is also sometimes extended to an act made for relief of insolvent debtors in the several prisons; by setting those who are qualified, at liberty from their debts and confinement.

GRACE, *Covenant of*. See COVENANT.

GRACE Cup, so called because the beverage contained in it was circulated amongst the community, or other company, at a particular time, and by a special favour. It was also called *Poculum Charitatis*, or the *Cup of Charity*, as being intended to indicate and promote brotherly love. At other times it was termed the *Wassel Cup* or *Bowl*, because each one of the company, in drinking out of it, drank health to his next neighbour in the old terms, *Was heil*. William of Malmesbury, describing the customs of Glastonbury abbey soon after the conquest, says, that on such and such particular days, the monks had "Medonem in iustis et vinum in charitatem." Mead in their cans, and wine in the grace cup. A large cup or bowl of this nature was always heretofore placed on the table of princes, &c. as well as of abbots. In the eleventh volume of the *Archæologia* there is an engraving of a grace cup, which formerly belonged to Glastonbury abbey, and a dissertation upon it by Dr. Milner. The inside of this cup, which holds two quarts, is furnished with eight pegs, at equal distances, one below the other, in conformity with Edgar's law, to repress excess in drinking. This measurement allowed of half a pint to each person.

GRACE, *Days of*. See DAY, in *Law and Commerce*.

GRACE, *Herb of*. See RUE.

GRACES, GRATLE, in the *Canon Law*, are the same with what we otherwise call *provisions*; which see.

GRACES, *Expectative, Gratia Expectativa*. See EXPECTATIVE.

GRACES, *Gratia, Charities*, in the *Heathen Theology*, were fabulous deities, three in number, who attended on Venus.

Their names are Aglaia or Eglé, Thalia, and Euphrosyne; *i. e.* shining, flourishing, and gay; and they were supposed by some to be the daughters of Jupiter and Euryome, the daughter of Oceanus, and by others to be the daughters of Bacchus and Venus. Vossius de *Idol* lib. xiii. cap. 15. Homer (*Iliad*, lib. xiv.) changes the name of one of the graces, and calls her Palithée, and he is followed by Statius. (*Theb.* lib. ii.)

Some will have the graces to have been four, and make them the same with the *Hors*, *Hours*, or rather with the four seasons of the year. See HOURS.

The Lacedæmonians admitted only two of them, whom

they worshipped under the names of Clito and Phaenné. The Athenians allowed the same number, but denominated them Auxo and Hegemone.

A marble in the king of Prussia's cabinet represents the three graces in the usual manner, with a fourth, seated, and covered with a large veil, with the words underneath, *AD SORORES IIII*. Yet Mons. Beger will by no means allow the graces to have been four: the company there present, he understands to be the three graces, and Venus, who was their sister, as being daughter of Jupiter and Dione.

They are always supposed to have hold of each other's hands, and never parted. Thus Horace, (*lib. iii. od. 21.*) describes them:

"Segnefque nodum solvere gratiæ,"

They were also represented in the attitude of persons dancing; whence Horace says (*lib. i. od. 4.*):

"Alterno terram quatunt pede."

They were commonly thought to be young virgins. In the earlier ages they were represented only by mere stones, that were not cut; but they afterwards were represented under human figures, at first clad in gauze. But the custom of giving them drapery was laid aside; and they were painted naked to shew that the Graces borrow nothing from art, and that they have no other beauties than what are natural.

Yet, in the first ages, they were not represented naked, as appears from Pausanias, *lib. vi.* and *lib. ix.* who describes their temple and statues. They were of wood, all but their head, feet, and hands, which were white marble. Their robe or gown was gilt; one of them held in her hand a rose, another a die, and the third a sprig of myrtle.

They had temples, as we learn from Pausanias, at Elis, Delphos, Perga, Perinthus, Byzantium, and in several other places of Greece and Thrace. The temples consecrated to Cupid were also consecrated to the Graces; and it was also customary to give them a place in those of Mercury, in order to teach men, that even the god of eloquence needed their assistance. Indeed some authors reckoned the goddesses of persuasion in the number of the Graces, thus intimating, that the great secret of persuasion is to please. The Muses and the Graces had commonly but one temple; and Pindar invokes the Graces almost as often as he does the Muses. Festivals were appropriated to their honour through the whole course of the year, but the spring was chiefly consecrated to them as well as to Venus. Greece abounded with monuments sacred to these goddesses; and their figures were to be seen in most cities, done by the greatest masters. They were also represented on many medals. The favours which these goddesses were thought to dispense to mankind, were not only a good grace, gaiety, and equality of temper, but also liberality, eloquence, and wisdom, as Pindar informs us; but the most noble of all the prerogatives of the Graces was, that they presided over all kindnesses and gratitude; inasmuch that, in almost all languages, their names are used to express both gratitude and favours.

GRACES. There is a good article for Fr. music, by M. Framery, under the term *Agrémens*, *New Encycl. Meth.* p. 54: in this he candidly acknowledges all the defects ascribed to Fr. singing by Rousseau and Burney. See AGRÉMENS, RIFORMANTI, SHAKE, BEAT, TRILL, and *Musical CHARACTER*.

GRACIAN, BALTHASAR, in *Biography*, an eminent Spanish writer, was born in 1603. He entered among the Jesuits at the age of sixteen, and became a teacher in their society,

society, of the belles-lettres, of philosophy, and of theology. He likewise exercised the duties of a preacher, and was at length rector of the Jesuits' college of Tarragona, where he died in the year 1658. He was a much esteemed author, and most of his works have been translated into French and other foreign languages. The principal of these are "The Hero;" "Reflections on the political Conduct of Ferdinand the Catholic;" "A Treatise on the different Kinds of witty Conceptions." A work treating of the errors to which man is liable, and a collection of meditations on taking the holy communion. Moreri.

**GRACIAS A' DIOS**, in *Geography*, a town of Mexico, in the province of Honduras, and audience of Guatemala, situated at the mouth of a river, which communicates with the bay of Honduras. It has some gold mines in its neighbourhood. N. lat.  $14^{\circ} 30'$ . W. long.  $90^{\circ} 6'$ —Also, a cape on the N. coast discovered by Columbus. N. lat.  $15^{\circ}$ . E. long.  $132^{\circ} 50'$ —Also, a cape, called "False Cape Gracias a' Dios," on the coast of Nicaragua, 63 miles from the other. N. lat.  $13^{\circ} 36'$ .

**GRACILIS**, in *Anatomy*, a muscle of the leg, thus called from its slender shape.

It arises partly tendinous, and partly fleshy, from the os pubis internally, between the first and second heads of the triceps; and in its descent on the inside of the thigh, grows narrow, and becomes tendinous, a little below the sartorius, and is thus inserted into the tibia. It assists in bringing the thigh and leg inwards.

**GRACILIS Rectus**, a name given by Riolan to one of the muscles of the leg, called by Winslow the rectus cruris anterior, and by Cowper the rectus femoris. Albinus calls it the rectus cruris.

**GRACULA**, in *Ornithology*, a genus of the order Picæ, having the bill convex and acute at the edges, the base rather naked: tongue entire, sharpish, and fleshy; and the feet formed for walking. The genus gracula corresponds with the mainate of Brisson, from whom it appears to have been adopted by Linnæus under the former term. Some of the species of this natural tribe were known to Ray, who refers them to the crows; and also to Willughby, who considers them as of the stare or starling kind. The species of gracula, described in the Gmelinian Systema Naturæ, amount to twelve; and this number is increased to fourteen in the work entitled "Index Ornithologicus" of Dr. Latham, by the addition of the new species *iberops*, and the introduction of the Linnæan *Paradisæa tristis*, which latter the last mentioned writer has deemed it requisite to remove to this place. As a secondary to the essential or generic character above described, it may be proper to observe that the birds of this kind have the bill thick, and compressed at the sides; the nostrils small, at the base of the bill and sometimes situated near the edge; the toes three forward and one behind, the middle toe connected at the base to the outer one, and the claws hooked and sharp. Their principal food consists of fruits and insects.

#### Species.

**RELIGIOSA**. Violet-black; spot on the wing white; band on the hind head naked and yellow. Gmel. Linn. *Mainatus*, Briss. *Sturnus indicus Bontii*, Ray. *Bontius's Indian stare*, Will. *Le Mainate*, Buff. *Minor grakle*, Albin.

The length of this bird is ten inches and a half, its bulk equal to that of the black-bird: the bill an inch and a half long, of an orange colour tipped with yellow; the legs tawny or orange; feathers of the head, except the middle

ones, very short and silky; and the naked band reaching nearly to the nape. This species is found in many parts of India, and not unfrequently in a tame or domesticated state, being naturally of a familiar disposition, and capable of being taught to whistle, sing, and imitate the articulations of the human voice with greater precision than any of the parrot tribe. In the islands of Sumatra and Java it is called by the natives *hill-maynoa*, and in China, whither it is imported from the latter place, its common name is Tecong. Several supposed varieties of this bird are described by writers, the most remarkable of which is that called the greater minor grakle, le grand mainate of Brisson; this entirely corresponds with the ordinary kind, except in size, which it materially exceeds, being in this respect not inferior to the jackdaw; it inhabits the island of Hainan, in Asia.

**CALVA**.—Sub-cinereous, with the head naked each side. Linn. *Merula calva Philippinensis*, Briss. *Merle noire des Philippines*, Buff. *Goulin*, ab. *Iing*, *Tabadura*, et *Gulin*, &c. Phil. Transf. *Bald grakle*, Lath.

Size of the black-bird, with the head and cheeks bare of feathers and flesh-coloured, except a narrow list of short brown feathers, extending from the base of the bill to the back of the head; the naked part becoming of a deep red when the bird is irritated: the general colour above is silvery-ash, beneath grey-brown, bill and legs brown. These birds build their nest in the hollows of trees, especially preferring those of the cocoa-nut: it is represented as a noisy chattering bird, of voracious appetite, and as living principally on fruit. Found in the Philippine islands.

**FOETIDA**. Black; exterior part of the quill-feathers blueish; band round the neck naked. Linn.

Native of America, in size resembling the magpie: the head with erect, short, silky feathers; nostrils oval and naked; tongue sharp; and tail even at the tip.

**BARITA**. Somewhat grey; shoulders blue; quill-feathers at the outer edge green. Linn. *Monedula tota nigra*, Ray. *Boat-tailed grakle*, Lath.

Size of the cuckoo: the bill shortish, rather black, paler beneath and naked at the base; the plumage black, inclining to grey, and glossed with purple; tail rounded, concave when folded, and becoming flat on being expanded; legs and claws black. The species inhabits the Antilly islands and North America. It feeds on insects and fruits.

**CRISTATELLA**. Black, the first quill-feathers at the base, and tail-feathers at the tip white; bill yellow. Gmel. *Merula sinensis cristata*, Briss. *Merle huppe de la Chine*, Buff. *Chinese starling or black-bird*, Edwards.

A species rather larger than the black-bird; the plumage inclining to blue, with a crest of feathers on the head which it can raise and depress at pleasure; greater quill-feathers from the base to the middle white, the remaining part deep blue; tail-feathers, except the two in the middle, tipped with white; legs dull yellow. The crested grakle sings and talks like the species religiosa, but with inferior distinctness; and is frequently kept in cages in China, which country it inhabits in a wild state; its principal food is rice, worms, and insects.

**SAULARIS**. Blueish-black; belly, spot on the wings, and lateral tail-feathers white. Gmel. *Lanius langalensis niger*, Briss. *Pie grieeke noir de Bengale*, Buff. *Bengal magpie or dial-bird*, Albin. *Dial grakle*.

Native of Bengal. Size of the Missel thrush, with the head, neck, breast, back, rump and upper tail-coverts black; belly, sides, thighs, and under tail-coverts white; tail even at the end, black above, and white beneath. The female differs in being black instead of brown on the fore-

part of the neck and breast, and in the white being more obscure.

**QUISCALA.** Violet, black; tail rounded. Linn. *Picus jamaicensis*, Briff. *Cornix purpurea*, Klein. *Fur-zee*, Kalm. *Izanah*, Ray. *Black-bird, or maize-thief*, Kalm. Tr. *Purple grackle*, Arct. Zool.

Native of Mexico, and the warmer parts of America, and the West Indies; sings finely, builds on trees, is destructive to plantations, but useful in destroying the noxious insects that infest them. The flesh is black and unfavoury. Its size is about that of the black-bird, the male a little exceeding the female in bulk; the bill and legs are black; tail long and cuneated, and with the wings purple; the female entirely dusky.

**ATTHIS.** Greenish-blue; belly rusty; legs blood-red, Linn. *Corvus Ægyptius*, Hasselq. *Egyptian grackle*, Lath.

Size of a lark; and is supposed by Hasselquist to feed on insects, the remains of centipedes and scorpions being found in the stomach. The bill is black; neck with a longitudinal rusty line each side, and the claws black.

**LONGIROSTRA.** Brown, beneath ochre-yellow; head and neck black; band round the neck naked and wrinkled; area of the wings white; tail cuneated, black, and at the tip white. Pallas, &c.

Native of South America; length eight inches. This appears to be the same species as that described by Sonnini under the name of merle des Savannes.

**STURNINA.** Hoary; spot on the crown and back between the wings violet-black; tail and wings with a tinge of green, the latter with a double white stripe. Pallas.

Inhabits the Ozier banks of Dauria; the nest and eggs resemble those of the thrush; the plumage of the female is dirty ash, with the back brown; and the wings and tail deep black.

**ICTEROPS.** Black; band on the wings and body beneath white; the region of the eyes naked and wrinkled. Lath. *Le mainate a face jaune*, Vieill. *Yellow faced grackle*.

Length seven inches and a half; bill compressed; nostrils oval; legs yellow and wrinkled. Native of New Holland.

**CAYANENSIS.** Striated; above tawny, beneath yellowish; head and chin varied with tawny and white; tail wedged, sharp and with the wings tawny. Gmel. *Climbing grackle*.

Inhabits the interior parts of Guiana; is about ten inches in length, and remarkable for climbing trees; the bill is black, about two inches long, and a little curved; the legs are also black.

**CARUNCULATA.** Cinereous; tail and quill-feathers black; crown and chin with warty excrescences. Gmel.

Length six inches; and supposed to inhabit the Cape of Good Hope.

**MELANOCEPHALA.** Head black, front white; back, tail, and wing-coverts blueish-ash, the tail with a transverse white streak near the extremity. Don. *Gracula melanocephala*, Lath. *Le mainate a tête noire*, Vieill. *Black-headed grackle*.

A species recently discovered in New South Wales; its height is about eight inches; the bill yellow, a little bent, and formed at the base like that of the *Turdus*, or thrush tribe; the tail three inches long; the legs very long in proportion, of a pale yellow ochre-colour, and armed with strong blackish claws.

**VIRIDIS.** Dull green; throat above brown and blackish varied; under parts of the plumage whitish, with some blackish streaks; wings blackish, edged with white; tail blackish, with white tip. Don. *Gracula viridis*, Lath. *Le mainate vert*, Vieill. *Green grackle*.

Lately found; the species inhabits New Holland, and

appears to be very rare; the bill is strong, somewhat inclining at the base, and the colour of horn; the legs blackish.

**CYANOTIS.** Space about the eyes bare of feathers and bright blue; head black, with a white cross on the hind part; upper part of the neck, body, scapulars, wing-coverts, and tail yellowish-green; breast lead-colour; plumage beneath white. Don. *Gracula cyanotis*, Lath. *Le mainate a oreilles bleues*, Vieill. *Blue eared grackle*.

Length twelve inches and a half; bill black; legs blue black, with very hooked black claws. Native of New South Wales.

**PICATA.** Greater part of the head, the neck; transverse band on the breast, back, border of the wings, and tail above nearly to the tip black; throat, breast, wing-coverts, body beneath, and under surface of the tail-feathers white. Don. *Gracula picata*, Lath. *Le mainate pie*, Vieill. *Pie grackle*.

Rather larger than the black-headed grackle, and like that species inhabits the regions of Australasia; the general colour black and white, the former partially glossed with purple; bill yellow, and corresponding in form with that of the black-headed grackle; and the legs lead colour.

**GRACULUS**, the *Shagge*, a species of *Pelecanus*; which see.—Also, a species of *Corvus*; which see.

**GRADATION**, the act of ascending, step by step, to any pitch or eminence: from the Latin *gradus*, *degree*, *step*.

**GRADATION**, in *Architecture*, signifies an artful disposition of parts, rising, as it were, by steps or degrees, after the manner of an amphitheatre: so that those placed before do no disservice, but rather service, to those behind.

The painters also use the word gradation for an insensible change of colour, by the diminution of the tints and shades. See below.

**GRADATION**, in *Chemistry*, is a kind of process belonging to metals. It consists in gradually raising, or exalting them to a higher degree of purity and goodness, so as to increase their weight, colour, consistence, &c.

**GRADATION**, in *Logic*, is an argumentation, consisting of four or more propositions, so disposed as that the attribute of the first is the subject of the second; and the attribute of the second is the subject of the third, and so on, till the last attribute come to be predicated of the subject of the first proposition. As in Porphyry's tree; man is an animal; an animal is a living thing; a living thing is a body; a body is a substance: therefore man is a substance.

An argument of this kind is liable to many fallacies; both from the ambiguity of words and things; *e. gr.* Peter is a man; man is an animal; animal is a genus; genus is an universal; therefore Peter is an universal.

**GRADATION**, in *Painting*, relates both to chiaro-scuro and to colour: that is, all the different degrees in which light and dark, and colour may be modified, are comprehended in it.

An object receding from the light, and gradually losing it, becomes at its farthest extremity obscurely defined. A coloured body, pure or bright in tint, under the same circumstances, gradually diminishes in clearness of hue throughout its receding parts, and becomes dull and dark. By fixing the scale of gradation in both these particulars, effects of great force or great simplicity may be produced. The scale of descent being made rapid, great force will ensue, from the strong oppositions it promotes; and the reverse will take place when the degrees of descent are prolonged, and less contrast thereby effected. The nature of the sub-



ject, and the situation of the figures with regard to light, must be the artist's guide in this matter.

The *gradation of colour* includes not only what is mentioned above, *viz.* the different degrees of purity, or brilliancy of the same colour, but also the approximations of each colour to its neighbour, necessary to produce harmony; and also the art of gradually losing the local colour in obscurity, and yet maintaining the character of it in the object: which is extremely difficult and of great importance in the art of painting.

**GRADATION**, in *Rhetoric*, is when a series of considerations or proofs is brought rising by degrees, and improving each on the other. See **CLIMAX**.

Such is that in Cicero to Herennius: "Africano industria virtutem, virtus gloriam, gloria remulos comparavit."

**GRADI**, *Italian*, degrees. Every ecclesiastical mode, and every key in secular music, has its *gradus*, its scale; no note of which can be changed by an accidental *flat*, *sharp*, or *natural*, without changing the key. As in the key of F major with one flat at the clef, annul that flat by a natural, and the key is changed to C, add another flat and it modulates into B b.

**GRADISCA**, or **GRADISCH**, in *Geography*, a town of Germany, and capital of a small county, annexed with Goritz to the dominions of Austria, seated on the Lizonzo, built in the year 1473 to stop the incursions of the Turks, additionally fortified in 1764, and erected into a bishopric in 1784; taken by the French in 1797:—5 miles S. of Goritz. N. lat. 46° 2'. E. long. 13° 27'.—Also, a town of Sclavonia, on the river Save, near the borders of Croatia, well peopled and fortified; 132 miles W. of Belgrade. N. lat. 45° 10'. E. long. 17° 50'.

**GRADISELLO**, a town of Italy, in the department of the Adda and Oglio; 8 miles S. of Breno.

**GRADISTA**, a town of European Turkey, in Bulgaria, on the borders of Servia; 40 miles S. of Viddin.

**GRADISZTE**, a town of Walachia; 48 miles N.E. of Galacz. N. lat. 45° 23'. E. long. 27° 19'.

**GRADITZ**, a town of Bohemia, in the circle of Konigingratz; burnt by Zisca; 12 miles N. of Konigingratz.

**GRADO**, a small island in the gulf of Venice, near the coast of Friuli, with a town which was the first see of the Venetian patriarch. N. lat. 45°. E. long. 13° 17'.

**GRADUAL**, **GRADUALE**, was anciently a church-book, containing divers prayers, rehearsed, or sung, after the epistle: called in some of our ancient writers *gradile*, *graduale*, *graille*, &c.

After reading the epistle, the chantor ascended the ambo with his gradual, and rehearsed the prayers, &c. therein; being answered by the choir; whence the name gradual, on account of the steps or degrees of the ambo.

The gradual or graille, which the provincial constitutions of archbishop Winchelsea, made at Merton, A. D. 1305, required to be in every church, was a book containing all that was to be sung by the choir at high mass; the tracts, sequences, hallelujahs; the creed, offertory; trifagium, and also the office for sprinkling the holy water. "Gradale sic dictum, à gradalibus in tali libro contentis."

It is sometimes taken for a mass-book, or part of it, instituted by pope Celestine, anno 430. See stat. 37 Hen. VI. cap. 32.

In the Romish church, gradual is an appellation still given to a verse which they sing after an epistle, and which

was anciently rehearsed on the steps of the altar: though Ugutio gives us another account, and says it took its denomination gradual because sung in the gradual ascent from note to note. Magri speaks differently still, and will have it to have taken its name because sung while the deacon went up the stairs to the pulpit, to sing the Gospel.

**GRADUAL**, *Gradualis*, is also applied to the fifteen psalms, sung among the Hebrews, on the fifteen steps of the temple. Others are rather of opinion that they were thus denominated because the singers raised their voice by degrees, from the first to the last.

Cardinal Bona, in his treatise of Divine Psalmody, says, the fifteen gradual psalms are intended to represent to the mind, that we only arrive at the perfection of goodness, or holiness, by degrees. He goes on to lay down the fifteen degrees of virtue, corresponding to the fifteen psalms; five of them are for beginners; five for proficients; and the rest for the perfect.

**GRADUATE**, a person who has the degrees of any faculty: a graduate in physic, in divinity, in music, &c. See **DEGREE**, **DOCTOR**, &c.

This privilege of graduates is no older than the fifteenth century: it being observed, that men of learning were much neglected by the collators, and patrons of churches; complaint, therefore, was made to the council of Basil, where this decree was made; which was afterwards confirmed by the Pragmatic Sanction, and again by the Concordat.

**GRADUATION of Astronomical Instruments**, is the dividing of a circle, or of some aliquot part thereof, into degrees and its sub-divisions, on the limb of any instrument that is used for measuring angles with a great degree of accuracy. (See the article **DEGREE**.) When the instrument to be graduated is of a portable size, admitting of only a small radius of curvature for the limb that is to be divided, the operation is very readily as well as accurately performed by an engine, such as Ramsden's or Troughton's, the former of which we have described under the article *ENGINE for dividing Circles*, &c. but when the radius of the instrument is too large to admit of division by an engine, the task of graduating, by the determination and adoption of original dividing points or lines, requires no ordinary portion of skill, manual dexterity, and perseverance to be united. Before the establishment of the Royal Observatory at Greenwich, the art of graduating was in a rude state, but a desire to have this institution furnished with superior instruments of observation has stimulated the different astronomers royal, successively, to encourage the talents of superior artists from time to time, till at length such perfection is attained, that little more can now be hoped for in the improvement of our best English instruments. The history of the art of graduating astronomical instruments, and the gradual development of the most convenient and most accurate modes of proceeding, together with the difficulties to be surmounted in the various stages of progress towards perfection, will be best explained by a concise detail of each successive method of dividing, that has been practised, agreeably to the order of time; and by remarks arising out of each detail, as they most naturally occur.

We know not sufficient of the astrolabes of Hipparchus and Ptolemy to enable us to give any satisfactory account of the nature and accuracy of their divisions and sub-divisions, though it is probable that the graduated circles on them contained each 360°, agreeably to the Egyptian mode of dividing the circle. Neither can we give a very perfect description

scription of the manner in which Copernicus, long afterwards, had his astrolabe and meridian quadrant graduated, though we have shewn under our article CIRCLE that his parallactical instrument, with which his altitudes were chiefly taken, had its limb divided by equal divisions that were the subtenses of  $3' 49''$  each.

Tycho Brahe's instruments had the advantage of a long radius, which rendered any inequalities that might occur in his divisions of less value than they would have been in instruments of short radii; the smallest sub-divisions into which he professed to mark his spaces were  $10'$  each, and the single minutes and portions of a minute, even to  $15''$  and  $10''$ , were indicated by triangular diagonals; but with what degree of precision the sub-divisions were effected, and what dependence could be placed on his diagonals, as to accuracy, at this distance of time, it is not an easy matter to ascertain: it is recorded, however, that the operation of graduating his instruments was performed by his own manual labour.

And what we have here said of the instruments of Tycho Brahe, is equally true of the *machina celestis* of Hevelius; whatever accuracy his apparatus possessed, was the result of his own persevering industry, but we are not aware that his method of proceeding had been particularly detailed.

In Dr. Hook's Annadvations on the *Machina Celestis* of Hevelius, 1674, this very ingenious mechanist has published an account of his method of racking the exterior edge of the limb of his quadrant, as performed by Tompion, which method, he says, "does not at all depend upon the care and diligence of the instrument-maker, in dividing, graving, or numbering the divisions, for the same screw makes it from end to end." But, as Smeaton has very properly observed, this inventive contriver has not given his reader any precautions or particular directions how the perfection of the screw is to be ensured, or how the notches of the rack work are to be rendered perfectly equal among themselves, notwithstanding the unequal densities, and hardness of different portions of the metal so racked. The difficulties alluded to here, were acknowledged by the duc de Chaulnes, in a memoir of the Royal Academy of Sciences at Paris, published in the year 1765. The doctor called the account of his method, "an explication of the new way of dividing," and as an original invention, it may probably be called his own, though the want of a perfect screw, with intervals exactly proportioned to the effective radius of his quadrant, was a source of error, that posterior contrivances were required to remedy. See ENGINE (by Ramsden) for cutting the screws of the circular dividing engine.

The use of Dr. Hook's screw for racking the limb of an astronomical instrument was not, however, abandoned, without a fair trial of its accuracy in reading the quantity of the angles so measured; for Flamsteed, (or Flamsteed,) on his appointment to the Royal Observatory in 1676, employed Tompion to construct him a sextant of six feet nine and a quarter inches radius, at the expence of Jonas Moore, with an endless screw of seventeen threads per inch, acting on the racked edge of the limb, and with telescopic sights, which had not been before used: the result of this trial was, that some shake took place in the notches, that were worn by the screw, and frequently an error of a whole minute in reading an observation was unavoidably produced thereby. To remedy this evil, in the following year degree spaces, with diagonal divisions to read to the accuracy of  $10''$ , were added as a check on the measures of the screw, and a column, to contain the check angle by diagonal lines, was filled up from the 11th of September of the year 1677. These additions, it appears, from the *Prolegomena* of the *Historia Celestis*, were inserted by Flamsteed himself, and a comparison of the screw with

the diagonals proved that an error of as much as *one minute* was frequently the result of the reading by the screw. In an observation of the moon, taken on the 9th of June 1687, Smeaton says, that on looking over the observations, he detected an error of  $55''$ , which, upon a radius of six feet nine inches, he calculates amounts to more than  $\frac{1}{5}$ th part of an inch. The screw, however, was useful for giving a regular slow motion to the telescopic sights, and though its use, as an accurate measure of a large arc, was soon abandoned in astronomical instruments, it has been retained as an excellent mode of producing a slow motion, by the aid of a tapped clamping piece, and has been applied with great success to the limb of a dividing engine, which, being a complete circle, admits of equalization of the contiguous notches, by a long continued simultaneous action of several threads of a very perfect screw, carried many times all round the circle, when the exact situations of distant notches have been ensured by the checks afforded by accurate divisions, previously made on its plane.

Notwithstanding what we have above said of the imperfect measurement of an angle by the screw, it was not relinquished without another trial in Flamsteed's time, by Abraham Sharp, his amanuensis, to whose skill and dexterity in manual operations of a mechanical nature both Flamsteed and Smeaton have borne ample testimony; the latter of whom says, "I look upon Mr. Sharp to have been the first person that cut accurate and delicate divisions upon astronomical instruments." The instrument at which Sharp laboured, and to which he applied the screw in conjunction with the diagonals of the divided spaces, in 1689, was the *mural arc* at Greenwich, of which the radius is six feet seven inches and a half. "But yet," says Smeaton, in his paper on this subject, read November 17, 1785, at the Royal Society's room, "whoever compares the different parts of the table for conversion of the revolutions, and parts of the screw belonging to the mural arc into degrees, minutes, and seconds, with each other, at the same distance from the zenith on different sides, and with their halves, quarters, &c. will find as notable a disagreement of the screw-work from the hand-divisions, as had appeared before in the work of Mr. Tompion; and hence we may conclude, that the method of Dr. Hook, being executed by two such masterly hands as Tompion and Sharp, and found defective, is in reality not to be depended on in nice matters."

This inference of Smeaton obviously implies, that what he calls the *hand-divisions* of the mural arc, are more accurate than the readings by the screw alone; but, as he has given no other test of the accuracy of these hand-divisions, nor has explained by what process they were inserted, the more legitimate inference would have been, that either the screw, or the hand-divisions may be faulty, or both may be so in their respective degrees. It is to be regretted that Sharp, who was a mathematician as well as a mechanist, has not published the method he adopted of marking out and cutting his dividing lines, which is more immediately the subject of our present article. Had he made his hand-divisions first, and checked his notches, made by the screw, thereby, as Ramsden did with his engine afterwards, his measures by the screw would have been more perfect, though the centre-work might have been liable to be galled by too much pressure of the screw against the notched edge of the instrument, when frequently used.

Nearly about the time that the mural arc was fixed at Greenwich, Olaus Roemer, the Danish astronomer, supplied his domestic observatory with an instrument that had divisions and telescopic sights moving in the meridian, by means of a long axis, common to both the divided arc and telescope, which

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which therefore admitted of better adjustment for the vertical motion than the mural arc was capable of; and which may be considered as the first *transit instrument* that properly deserves such a name. In dividing his arc, Mr. Roemer disregarded the total length, with respect to an exact number of degrees, and looked more particularly to the equality of the divisions, which were convertible into degrees and minutes, by a table calculated for this purpose. The method he made choice of, for rendering his divisions equal, was to begin at one end of his arc, and to proceed by stepping, and by marking the dividing points with a proper pressure at each step, till the whole arc was finished: for this purpose he did not depend on a pair of dividers, however strong their legs, but two fine pointed pieces of strong tempered steel were tied, or otherwise fixed together in such a way, that the distance between the two points was  $\frac{1}{4}$ th or  $\frac{1}{5}$ th of an inch, and the radius of the arc to be divided was so proportioned, from 2 $\frac{1}{2}$  to 3 feet, that this distance made a space very nearly equal to 10'; whether exactly so, or not, did not signify, as the difference was allowed for by the calculated table, when an angle had been read by the divided spaces as numbered. It is easy to conceive that this mode of measuring an angle would be as accurate as any other, after the due allowance was made, provided the spaces were perfectly equal to each other; but the theory of this method is more perfect than the practice; for none of the mixed metals is so perfectly uniform in its density, and so free from hard particles, occasionally met with by the stepping points, as to ensure the perfect equality of the divided spaces, however carefully the stepping points are pressed in a vertical direction; the smallest deviation on making the first impression becomes greater by pressure, and an attempt to rectify any erroneous points can never be depended upon: but, what is worse, every individual deviation from perfect equality is charged on the whole arc, which therefore will be either longer or shorter than the true length, by the aggregate of all the positive, or negative quantities, that predominate in the inequalities of the individual spaces thus divided; and the longer the arc is from the first point, when any angle is measured, the greater is the error of the measurement in all probability, because the greater is the probable aggregate of the deviations from perfect equality in the spaces. The total arc thus divided was about 75°; but as Roemer applied no correction to the errors of the distant divisions of this arc, no dependence could be placed on the result of the readings, even when converted into degrees and minutes by his table, which supposed the arc perfectly divided.

The next ingenious artist who distinguished himself in the art of graduating astronomical instruments, was the celebrated Graham. At the appointment of Dr. Halley to the Royal Observatory of Greenwich, Flamsteed's instruments were removed by his executors, and in the year 1725. Graham undertook the construction of a new mural quadrant, which remains as a standing proof of his skill, to this day, in the said observatory. This artist availed himself of every contrivance that had been practised by his predecessors, and invented such a strong, and, at the same time, light method of constructing the frame-work of the iron quadrant, constructed by Jonathan Sisson, as evinced his superior knowledge of mechanics, as well as Sisson's precision in the workmanship. The diagonals were now rejected, as being incapable of being read by a fiducial edge with requisite exactness, and the vernier scale was substituted as much preferable in this respect, and the beam-compass, with equal advantage, was substituted for the ruler and dividing knife, which were liable to considerable parallax, notwithstanding

the greatest precaution taken in drawing the dividing lines, or in marking the dividing points. The screw for slow motion was also used for dividing the vernier scale in a proper way, after its value was ascertained; and its perfection was ensured, with respect to the due inclination of its threads all round, as well as to the equality of their spaces; and lastly, in order that the advantage of *continual bisecting* might be introduced as a *check* on the degree spaces, the quadrant was divided in 96 spaces, with sub-divisions, in a separate arc; and the readings from the 96th arc were a constant test of the readings by the 90, when converted into degrees and minutes by calculation, or by a table used for that purpose.

As it is not our intention to describe here the structure of Graham's quadrant, but merely to describe his method of graduating the limb of brass, which was laid over the iron frame, we shall satisfy ourselves by stating that two separate arches were struck by a beam-compass, the radii from bounding by several bracing pieces; the respective radii of which were 96.85, and 95.8 inches. The inner arch was divided into exact degrees, and twelfth parts of a degree, or 5' spaces; but the outer one was divided, as we have said, into 96 equal parts, and each of these again sub-divided into 16 equal parts, so that the sub-divisions were to each other as 10800 : 1536, or in smaller number, as 25 : 32. To carry to the reader an idea how the arcs were divided, suppose the quadrant to be represented by *fig. 1.* of *Plate XVIII.* of *Astronomical Instruments*, and that the occult line *a b d* be required to be divided into degrees by points inserted thereon, as centres for cutting the dividing lines from; the known property of the circle, that the chord of sixty degrees is always equal to the radius, afforded the means of laying down the total arc of 90 in the first place; thus, from the point *a*, or zero of the arc, the point *b* was marked by measurement of the same points of the beam-compass unaltered, that struck the occult line; and this arc of 60° was bisected at *c* by an extent nearly equal to the chord of 30 from the points *a* and *b* respectively; the extent, however, being a trifle less than the chord of 30, the two sweeps did not intersect each other, but approached so nearly together, that the small space between the sweeping lines was bisected by a point put in by hand, by the assistance of a magnifying eye-glass: the distance of this point *c* from *a* or from *b* being the chord of 30°, was laid along the limb from *b* to *d*, the extreme point of the whole arc of 90, and when this operation was so carefully performed, that the arcs *a c*, *c b*, and *b d* were precisely of the same length, when compared with each other, the total arc might safely be depended on, as being of its true dimensions. During this nice operation, it was perceived, that the length of the dividing beam had not altered by any variation of temperature. The next step was to bisect each of the three arcs of 30 into six of 15 each, in the same manner, as *a b*, the arc of 60, was bisected into *a c* and *c b*: but the arcs of 15 were not divisible into a lower number than three parts of each 5; in order to tripartite each arc of 15, a separate arc was used, as an arc of trial, described by the original radius unaltered, and 15 were transferred to it, and divided by trial till one-third of it was ascertained to measure exactly the distance between the two points of the compass; this distance was then laid out each way from each of the aforesaid points of the arc of 15, and the chord space of each being found equal to their contiguous first and second spaces thus measured, the whole arc was sub-divided into 18 equal arcs of 5° each; in the same manner, a fifth part of one of the arcs of 5° first transferred upon another part of the arc of trial, was ascertained by repeated additions and examinations, and then inserted within the divisions of the

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divided arc, by turning the points over twice each way, from every point already laid down, and then the middle space of each five being found equal to the extreme as well as contiguous spaces respectively, the whole arc was subdivided into points of one degree of distance from each other. But to ensure a perfect equality among these spaces required great steadiness of hand, as well as observation of the eye, and caution, to preserve the regulated distances of the points, unaltered during the operation. Of course, the marking point was required to be fine, and at the same time well tempered, as well as strong enough to bear pressure, which pressure was also necessary to be made in a perpendicular direction on the face of the limb. The sub-divisions of the degree spaces into 12 parts of 5' each, were done first by trisection, and then by bisection, or *vice versa*, in the manner we have already described; and the delicacy of these operations, on so small a scale, required extraordinary attention and care to ensure perfect equality among the smallest sub-divisions, which were now in a state to be transferred by lines tending to the centre of the arc to be graduated. This was an operation that could not be done well by the straight edge of a rule, and a marking point, or dividing knife that would be liable to deviate a little, notwithstanding the greatest care; here another, but smaller beam-compass was substituted for the ruler, probably for the first time, for the purpose of transferring the graduated points from the occult arc into the arc to be graduated, in the following manner; suppose the points *g* and *e* to be intended to be transferred; because the lines to be cut, as the dividing lines, are required to be in a direction tending directly towards the centre *o* of the concentric arcs, described on the limb; the distance of the cutting point, from the stationary point of the compass, was taken of such a length, that the cutting point crossed the arc to be cut at right angles, or, in other words, the beam was so situated, as to become a tangent to the arc to be cut; therefore the distance of the two points of the beam was regulated by the distance of the occult line of dots *c*, *b*, *d*, from the arc to be graduated by the straight lines, or rather by the curved lines, which in fact were substituted, and which passed without sensible error for straight lines, when the tangent line in question was long. From the point or dot *g*, the curve *b k* was drawn, and from the dot *e* the curve *f i*; but in such a way that a small portion only of each, that lies between the circular lines, was cut on the face of the instrument. In the same manner all the other dots were successively transferred, while each representative of the numerals 5, 10, 15, &c. were made longer than their intermediate lines of division, and the sub-dividing lines were again still shorter. The vernier carried by the telescope, when nicely and accurately divided, would detect any inaccuracy in the sub-divisions thus transferred, by the aid of a magnifier properly adjusted.

The arc of 96 divisions, with their sub-divisions, was not, properly speaking, graduated, but divided and sub-divided into portions of smaller value than degrees, and 5' spaces; but as the number chosen is divisible continually by the number two, it was completed by *continual bisections*, which method therefore requires no further explanation. We are told by Dr. Smith (in his Optics) that these two arcs were never found to differ from each other more than 5" or 6' on any part of the limb, but that when there is such difference, the preference ought to be given to the bisected arc of 96 divisions.

To prove that the spaces obtained by the lines of transfer are equal to those between the corresponding dots or points, let *e f a d g h* be joined, also *o f*, *o b*, *o c*, and *o g*; and the triangles *e o f*, *g o b*, will be every way similar, and equal to each other; therefore, if the common angle *e o b* be taken

away from the equal angles *e o f*, *g o b*, the angles *e o g* and *f o b*, that remain, will also be equal to each other.

It does not appear that Graham took any measures to guard against, or even to detect the errors that his method of dividing is liable to, from variations of temperature in his quadrant and beam, during the time that the operation is going on, and from the corresponding variations of length in the metals, according to their respective expansibilities; nor is it quite certain that he was aware of the probable extent of such errors, seeing he constructed the frame-work of his instruments of iron, and had his circle to be divided of brass. In Dr. Bradley's zenith sector made by Graham, Dr. Maskelyne has caused an iron limb to be substituted for the original brass one, and has had the points of division inserted on studs of gold, to avoid the errors that arose from the unequal expansibility of the different metals.

We might here mention Mr. H. Hindley's plan of dividing a circle by a toothed circular plate and endless screw in form of an engine, about the year 1740, but that we think his method of dividing and drilling the holes of his plate, by bending a straight slender bar of brass into a circle, and transferring the holes therefrom, cannot be depended on where much accuracy is required in the divisions of a circle. It was originally intended, and is much better calculated, for dividing and cutting the notches between the teeth of a wheel; but the reader may see the plan described, and some improvements on it proposed by Smeaton, in his paper already mentioned, as contained in the Philosophical Transactions of London, in the year 1785.

Jeremiah, the son of Jonathan Sisson, was of Graham's school of dividing, and did nearly as much justice to the method he adopted, as Graham himself, probably; and his nice care, and persevering assiduity, have classed him among the first dividers of his time; but we are not aware that he was the inventor of any original contrivance, except, perhaps, that he applied a triple index to some of his instruments, one of which had the vernier, and each of the others had a single line or stroke drawn at one-third of a circle from each other, and from zero of the vernier, which might act as a check on the eccentricity of the circle, as well as on the inequality of its divisions; though it does not appear certain that this was the original intention, as the three props of his vernier-bar in his theodolites required it to be triple; but in his circular indexes one stroke only was made, and that opposite the vernier: the importance of a triple vernier has not been noticed particularly by any one, previously to the time of Mr. Ed. Troughton's introduction of the triple vernier into his circular instruments. Mr. Ludlam, however, says, that Sisson very early rejected the method of trifecting, and that of stepping too. "Having (by means of the radius and bisections only) divided his quadrant into three arches of 30 each, he set off in each of these arches the chord of 21 20', or 256 times five minutes. This chord was taken off a scale of equal parts, and was checked by the chord of 8 40', both chords together filling up the arch of 30°. The arch of 21 20' was divided by continual bisections into arches of five minutes each." This description, says Mr. Ludlam, in a note to page 4, of his Introduction and Notes on Mr. Bird's method of dividing, was given by Jeremiah Sisson, in a private letter dated May 20, 1766; and according to the same letter it appears also, that Sisson placed the fixed or central point of his compass in a blank tangential line, as hereafter described by Bird, during the operation of transferring the divided points into linear divisions; but as Bird has in the year 1767 published these processes as originally his own, and as he worked for the Sissons previously to 1766, we are disposed to consider Bird, and not

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either of the Siffons, as the real contriver of the methods here adverted to. Siffon (the younger) rejected the arc of 96, as being only a help to a bad divider; but Bird used to retort on him, by saying, that good dividing was not afraid of such a test of its accuracy.

It is the characteristic of a great genius in mechanics, not to tread too closely in the steps of his predecessors, but, availing himself of any hints that may have been presented to him, to mark out a more direct and even path for himself, that shall throw in his way fewer obstacles to impede his progress. This was the case with Mr. Bird, who, having been brought up a cloth-weaver in the county of Durham, and having noticed some very coarse divisions on the face of a clock that fell in his way, immediately set about dividing one himself, in a much neater manner, and was so pleased with his success, that in the year 1740 he came to London, and was in business for himself as an instrument-maker, only five years afterwards. After having made himself acquainted with the methods at that time in use of dividing a circle, he saw that no one had guarded against the errors produced by the effects of variable temperature on the beam of the compass, as well as on the metal of the scales and circles to be divided; he also saw that bisection of an arc had so much advantage over trisection, or quinquesection, that he abandoned the latter modes of dividing altogether, and was the first probably to compute chord-lines, to be taken from a good *vernier* (what he calls *nonius*) scale, by the beam-compass, in order to determine such points in an arc of 90°, as may enable a division by continual bisection to be adopted, and at the same time such as may be laid down without loss of time, or, in other words, without sensible change of atmospheric temperature.

We cannot better describe Mr. Bird's method of dividing astronomical instruments than by using his own words. "The requisites," says he, "for the performance of this work are as follow: A scale of equal parts, by which the radius may be measured to 0.001 of an inch must be provided. My scale is 90 inches long, each inch divided into 10, contiguous to which are nonius (*vernier*) divisions, *viz.* 10.1 inches divided into 100 equal parts, shewing 0.001 of an inch, and by the assistance of a magnifying glass, of one inch focal length, a third of 0.001 may be taken off by estimation.

"Provide fine beam-compasses, to which magnifying glasses of not more than one inch focal length should be applied. Let the longest beam be sufficient to draw the arcs, and measure the radius; the 2d to measure the chord of 42° 40'; the 3d to measure the chord of 30°; the 4th, 10 20'; the 5th, 4° 40'; and if a sixth, to measure 15°, be made use of, so much the better.

"The radius of the arc of 90° at the points is equal to 95.938 inches, from which the following numbers were computed, *viz.* 49.6615 inches = chord of 30°; 25.0448 inches = chord of 15°; 17.279047 inches = chord of 10° 20'; 7.81186 inches = chord of 4° 40'; and 69.80318 inches = chord of 42° 40'. Having drawn the several arcs, between which the divisions were to be cut, the radius and the lengths of the above chords were taken by the beam-compasses, which, together with the scale, were laid upon the quadrant, where they remained till the next morning; during which time the door of the room was kept locked. Before sun-rise I re-measured the radius, which required some correction; the beam being of white fir, and the scale of brass, which probably contracted, while the beam remained unaltered; the other beam-compasses also required correction. Now the quadrant and scale being of the same temperature, the faint arc *b d* (*fig.* 2. of

Plate XVIII. of *Astronomical Instruments*.) was struck, and with a very fine prick-punch (*pointil*) the point *a* was made; with the same beam-compass unaltered I laid off from *a* to *e* the chord of 60°, marking also a fine point: with the chord of 30° *a e* was bisected in *c*. Now one point of the beam-compasses containing 60' was fixed in *c*, and with the other was marked the point *r* or 90° next, with the beam-compasses containing 15', was bisected *er* in *n* or 75°; from *n* was laid off the chord of 10° 20'; and from *r*, 4 40'; which two last chords joined exactly in *g*, being the point of 85° 20': now each degree being to be divided into 12 parts, or every 5', therefore,  $85 \div 12 + 4 = 1024$ , a number divisible by continual bisections. The last chord computed was 42° 40', with which *a g* was bisected in *o*; *a o* and *o g* were bisected by trials: but, whoever undertakes to divide a large quadrant, will do well to compute also the chord of 21° 20'; but for this chord any of the beam-compasses already provided, which will take in the length, may be used. The point *g*, being formed as above, I proceeded, by continual bisections, till I had the number required, *viz.* 1024. To fill up the space between *g* and *r*, containing 56 divisions, the chord of 64 divisions was laid off from *g* towards *d*, and divided like the rest by continual bisections; as was also from *a* towards *b*. The points 30°, 60°, 75°, and 90°, fell in without any sensible inequality."

So much will suffice for giving a general idea of Bird's proceedings, in *dividing* his astronomical instruments; but his method of transferring the divided points into dividing lines was equally original, and guarded also against errors that might arise from the handling of the beam during the operation, by variable temperature; before, however, we proceed to detail this process, it may be proper to observe, that the points made on the faint circle were inserted by a *pointil*, or piece of steel-wire, with a conical point made fast into a piece of cylindrical brass rounded at the upper end: the steel part was  $\frac{1}{16}$ th of an inch thick, and  $\frac{3}{16}$ ths of an inch long, and the brass part 2 $\frac{1}{2}$  long, and  $\frac{1}{4}$ th of an inch in diameter. The angle of the steel conical point was from 20° to 25°, and the point somewhat above a spring temper, so that the point made in the circle did not exceed 0.001 of an inch; as it was sharpened on an oil-stone while turning round, and while drawn in a direction outwards from the point itself, the surface partook of the nature of a conical shape when gently pressed on, as it revealed in the point of bisection, which point, by reason of the four angular burs made by the intersecting lines, could be *felt* as well as *seen*. The points of the beam-compasses were never made to approach nearer to each other than two or three inches, but at the ends of the arcs spring dividers, with conical points, were substituted to measure small arcs. Another precaution was, that in all bisections, the place to be pointed was laid off from left to right, and then from right to left, from the respective central points.

As the maxim, "that an arc may be *bisected*, but not practically *trisected* or *quinquesected* with certainty," was the maxim adopted by Bird, when he introduced the use of his scale for measuring the chords, so the maxim, "that a right line cannot be cut on brass, so as accurately to pass through two given points, but that a circle may be described from any centre, to pass accurately through a given point," was taken up by him when he adopted the beam-compass, as Graham and Siffon had done, for cutting the small portions of a circle, instead of perfectly straight lines, as boundaries of the divisions. His plan of doing this, however, was new, as may be seen from his own works.

"The next step," says he, "is to cut the linear divisions from

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from the points: the best instrument for this purpose is the beam-compass, having both its points conical and very sharp. Draw a tangent to the arc  $b d$ , suppose at  $e$ , it will intersect the arc  $x y$  in  $g$ , this will be the distance between the points of the beam-compass to cut the divisions (nearly) at right angles to the arc  $b d$ . Lodge that point of the beam-compass next your right hand, in the point  $r$ ; let the other fall freely into the arc  $x y$ ; press gently with your finger upon the screw-head that fastens the socket (and that is convex), and with the point towards the right hand cut the divisions. In this manner you must proceed with the rest."

The intention of transferring the central or resting point of the compass into a blank tangential line, instead of suffering the said point to rest in the respective points made in the faint arc, is, that in the former case should any alteration take place in the length of the beam, during the operation of cutting, no error is charged on the divisions cut, but the alteration is compensated by the distance of the newly made point in the tangential line from the cutting point; that is, each division is charged only with such a minute error, if any, as arises from temperature during the act of cutting a single stroke, and if one of the points should break, another may be replaced without inconvenience; whereas, by the method of Graham, a broken point produces considerable difficulty; and the whole error arising from temperature, during the whole process of cutting all the divisions, is charged not only on the total arc, but likewise in a certain undivided degree on each of the whole divisions. This idea of getting quit of the effects of temperature is ingenious, but has been objected to as liable to the ill effects of slipping in a certain degree, inasmuch as that a hard particle, lying under the point of rest, may cause a little deviation in the distance, before the stroke is cut. This objection, however, was not allowed to be realized by Bird, who no doubt must have obviated it by some other plan, had he found any real inconvenience arising from it. Great care, notwithstanding, must have been taken in setting down, and pressing on the point at rest, in a perpendicular direction. Another objection applied to Mr. Bird's scale, from which the chord-lines were measured, inasmuch as the scale itself might be erroneous in some places, and would impart its errors to the arcs measured from the computed chords taken therefrom.

Besides the arc of  $90^\circ$ , the mural arc by Bird had an arc of 96 divisions, like Graham's, divided by continual bisections, till each of the 96 divisions had 16 sub-divisions, as a check on the accuracy of the arc of degrees; but subsequent dividers of astronomical instruments have found this superfluous, as being in the opinion of others, as well as of Jeremiah Sisson, a check only on bad dividing, and as rendering the reduction of observations troublesome, when made thereby.

The vernier was retained by Bird as the best method he knew of sub-dividing the  $5'$  spaces into quantities of  $30''$  each, which was the smallest angle he professed to measure; and to effect his purpose he made ten divisions on his vernier equal to eleven on the limb of the instrument, first by computing the chord of thirty-two parts, and then by taking ten out of those parts, when bisected, as the proper divisions for the vernier; these, being made in points, were also transferred by a tangential line into linear divisions by the beam-compass, as before described; but great care was taken, that the stroke zero on the vernier was drawn from the quadrant's centre, precisely parallel to the line of collimation of the telescope. Mr. Ludlam says, that the cutting-point which Sisson used was flat in the knife-edge form, but that Bird's was a triangular prism, with a slope ground down to

a point at one of the angles; which formed the cutting-point.

At the request of the commissioners of the Board of Longitude, Mr. Bird, in the year 1767, published his method of dividing in a quarto pamphlet, for which they rewarded him with 500*l.* besides 60*l.* for his plates, after having bound him to instruct an apprentice of seven years in the art of contracting and dividing astronomical instruments.

Mr. Smeaton is of opinion that Bird's method of dividing may be improved in one respect, and expresses himself on the subject thus:

"I must here observe that I apprehend no quadrant, that has ever undergone a severe examination, has been found to form a perfect arch of  $90^\circ$ , nor is it at all necessary it should; the perfect equality of the divisions throughout the whole is the first and primary consideration; as the proportion of error, when ascertained by proper observations, can be as easily and readily applied when the whole error of the right angle is fifteen seconds, as when it is but five. In this view, from the radius taken, I would compute the chord of  $16^\circ$  only. If I had an excellent plain scale, I would use it, because I should expect the deviation from the right angle to be less than if taken from a scale of more moderate accuracy; but if not, the equality of the divisions would not be affected, though taken from any common diagonal scale. This chord, so prepared, I would lay off five times in succession, from the primary point of 0 given, which would complete  $80^\circ$ ; I would then bisect each of those arches of  $16^\circ$ , as prescribed by Mr. Bird, and laying off one of them beyond the 80th, would give the 88th degree, proceeding then by bisection, till I came to an arch of 2', laying that off from the 88th degree, would give the point of  $90^\circ$ . Proceeding still by bisection, till I had reduced the degrees into quarters of  $15'$  each, I would there stop, as from experience I know that when divisions are over close, the accuracy of them, even by bisections, cannot be so well attained, as where they are moderately large. If a space of  $\frac{1}{4}$ ths of an inch, which is a quarter of a degree, upon an eight feet radius, is thought too large an interval to draw the index over by the micrometer screw, this may be shortened by placing another line, at the distance of one-third of a division on each side of the index line, in which case the screw will never have to move the index plate more than one-third of a division, or  $5'$ , and the perfect equality of those side lines from the index line may be obtained, and adjusted to  $5'$  precisely, by putting each of the side lines upon a little plate, capable of adjustment to its true distance from the middle one, by an adjusting screw. The above hint is not confined to the chord of  $16^\circ$ , which prohibits the sub-division going lower than  $15'$ ; for if it be required to have divisions equivalent to  $5'$  upon the limb itself, then I would compute the chord of  $21^\circ 20'$  only; and laying it off four times from the primary point, the last would mark out the division  $85^\circ 20'$ , pointed out by Mr. Bird, supplying the remainder to a quadrant from the bisected divisions as they arise, and not by the application of other computed chords." Mr. Smeaton, sensible, however, that this method of laying  $16^\circ$  five times over, or  $21^\circ 20'$  four times over, may be objected to, as liable to the errors of *slipping*, arising from Roemer's method, afterwards proposes to lay down the chord of  $64'$ , or of  $85^\circ 20'$ , from computation all at once, and then to bisect, and complete the quadrant from the bisected divisions, which Mr. Bird himself prescribed as a good method for Hadley's sextants and octants. But these plans are now superseded for instruments of small radius by the dividing engine, which performs the work with great expedition, as well as accuracy, and the original methods of dividing the circle are only useful for the larger



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larger instruments, and for the finishing of the dividing engines themselves.

In the year after Mr. Bird had published an account of his method of dividing astronomical instruments, the duc de Chaulnes printed in French a folio work, entitled "Nouvelle methode pour diviser les Instrumens de Mathematique et d'Astronomie," and also a work proper to be bound with the former, called "Description d'un Microscope et de differens Micrometres desinés a mesurer des parties circulaires ou droites avec la plus grande precision." The former of these pamphlets contains 15 plates, and the latter six, which exhibit plans and drawings in different points of view, of all the apparatus, both in pieces and together; these are not necessary to be copied by us, but we will describe them as far as they fall within our present purpose. This new method of dividing is performed by the assistance of compound microscopes, with cross hairs in the focus of the eye-glasses of each, to be fixed to the circle to be divided in any given situation, and of moveable pieces of brass with fine dividing lines marked thereon, which may be so fixed with wax, as to be adjustable to the point of intersection in the focus of any of the microscopes, and when duly adjusted, a sliding point-trail, moving in a complex frame of brass, cuts the line, on the circle to be divided, that shall correspond to the point of the circle where the adjustable division is fixed; though the line cut is not in the same part of the circle. As this method may be considered as the ground-work of Ramsden's method of dividing a large circle, and has not, that we know of, been translated into our language, we will give the substance of that part of the work which more immediately relates to our present subject, without following the author through all his minute details. The circle, which the duc de Chaulnes proposes to divide by his original method, is the table of his dividing engine, but as it is equally applicable to any circle that may be fixed concentrically on it, we will suppose it an astronomical circle for altitudes or azimuths that is to be divided by his method. In the first place, he proposes to have from 30 to 40 thin pieces of smooth brass about one-third of an inch long, and one-sixth broad, having each a fine stroke drawn across, perpendicular to the long sides and just deep enough to be seen; and secondly, three compound microscopes are to be provided, one to be fixed diametrically opposite the point-trail, or cutting point, that is carried in and out, *i. e.* towards and from the centre of the circle by an adjustable frame, and the other two are adjustable to any given points along the plane of the circle to be divided. When the circular lines are struck on, the adjustable microscopes, which we will call A and B, are placed as opposite to each other, in a diametrical line, as can be guessed, or roughly measured by any of the ordinary means, and a moveable division on a piece of brass already described, is put by means of wax under each of the two microscopes, and moved by hand, till the lines, which must be in a radial direction, fall respectively under the centres or intersecting points of the fields of view; these microscopes, it must be understood, are fixed, not on the table which bears the circle, and which is made so as to revolve on a long vertical axis, but on a fixed or stationary surrounding frame, that is unconnected with the table itself, when the table is at liberty to revolve; suppose now the table and circle on it to be carried half round, while the microscopes remain fixed, in such a way that the moveable division which was under the microscope A, falls under the centre of microscope B; in this situation, if the opposite division falls under the centre of A, the circle is truly bisected; but as this is not likely to be the case at the first trial, the quantity that is over or short must be adjusted, one

half by the moveable division, and the other by the microscope, and the operation of reversing must be repeated, and the rectifications made, till the circle is found to be truly bisected, both backwards and forward, by the coincidence of the divisions with the intersected points in each focus of the microscopes. The two microscopes A and B may now be removed, and the third or fixed microscope must be made fast over one of these two dividing strokes, after the point-trail has been brought precisely to occupy the place of the other, in which situation the point-trail and the fixed microscope will stand so diametrically opposite each other, that whenever an adjustable line is brought to bisect the field of view of the microscope, the point-trail will be ready to cut a line on the opposite side of the circle, and when ever a set of adjustable divisions are properly placed, by the wax, on one semi-circle, the lines in the other semi-circle, directly opposite these respectively, can be permanently cut, before the moveable pieces are taken off, and afterwards the said lines to cut may be brought successively under the fixed microscope, in order that these opposites, where the moveable pieces were stuck on, may, in like manner, be cut; so that one-half of the circle will be sufficient to be divided and sub-divided by the adjustable pieces, seeing that each of its divisions and sub-divisions, brought in succession under the fixed microscope, may be instantly transferred by the point-trail, into the opposite semi-circle, and also these in their turn transferred back again. Let us now see how the semi-circle is divided and sub-divided by means of the two microscopes A and the fixed one, B being no longer wanted; the first operation is the trisection of it into arcs of each 60; for this purpose, while the point-trail remains at T, *fig.* 3, of *Plate XVIII.*, one of the points cut, *viz.* at 180°, and the fixed microscope rests at Z, or zero, *i. e.* the first point of the circle, to be figured 0 or 360; two moveable pieces are stuck on at C and D respectively, so as to trisection the semi-circle Z B T very nearly, and the microscope A is placed directly over C, so as to view its stroke or line at the point of intersection in the focus of the eye-glass; there it is made fast for the present; the line C is now brought under the fixed microscope at zero, by making the circle revolve, and suffered to remain; the piece D has its stroke put under the microscope A, as before was the case with piece C, now at zero; the circle is again made to revolve till the stroke of D is under the fixed microscope at zero; in this situation the point T, or 180°, will have been brought forward 120°, or 60° twice over, provided the pieces C and D were truly placed, and in this case an eye, looking into the microscope A, will see this dividing line bisect the field of view; but as this is not likely to happen at the first trial, the microscope must be moved one third of the error now shewn, and each of the pieces C and D another third, accordingly as the portions of the semi-circles Z C, C D, and D T taken together, are found to be more or less than an exact semi-circle. The operation we have here described is repeated again and again, till the three equidistant arcs amount to an exact semi-circle; after which they are rendered permanent, by strokes made successively on the opposite semi-circle, at the points *e* and *d*, which trisection the semi-circle T A Z, when the adjustable strokes C and D are in succession exactly fixed in the centre of the field of view of the fixed microscope. The distance between the two microscopes, which is here 60, is called the *opening* of the microscopes, which are considered as the two points of a pair of dividers, and the arc between them is therefore denominated accordingly.

The next step is to bisect the arcs of 60° each, into two of 30, by an opening of 30; to do this one moveable piece, stuck at the middle of each arc of 60°, will be requisite, and

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the two halves, to the right and left of each piece, may be examined and adjusted till the bisections are complete, and in a state to be transferred into the opposite semi-circle; for instance, suppose the arc of  $60^\circ$  from Z to C to be bisected, put a moveable stroke at  $30'$ , more or less, and place the microscope A over it; make the table and circle revolve till this stroke  $30'$  falls under the fixed microscope; in that situation, the stroke  $60^\circ$  ought to bisect the field of view of microscope A, and whatever the deviation may be, plus or minus, it must be adjusted by trial, partly by moving the microscope A, and partly by moving the piece with the stroke on at  $30'$ , when brought back again under the microscope A. In the same way, any other bisection may be made within the possible opening of the microscopes. Again, the arcs of  $30'$  are trisected, as before described, into arcs of  $10'$ , which are all transferred into the opposite semi-circle in succession.

With respect to the division of the arcs into smaller quantities than those of  $10'$ , where the microscopes approach too near together to admit of the necessary adjustments, an ingenious mode of sub-dividing is adopted by a property of the number 9, thus; having all the arcs of  $10'$  round the semi-circle laid down, the points  $90^\circ$  and  $180^\circ$  are of course among them, and as these are divisible by 9, an opening of nine degrees is taken by trial, which repeated ten times, by means of the moveable strokes, will reach from 0 to  $90^\circ$ , when properly adjusted; besides the  $10'$ ,  $20'$ ,  $30'$ , &c. there will now be  $9'$ ,  $18'$ ,  $27'$ , &c. up to  $90^\circ$ , and also  $99'$ ,  $108'$ ,  $117'$ , &c. up to  $180^\circ$ , and the differences or spaces left between the divisions obtained from  $10'$ , and those from  $9'$  repeated, will be respectively  $1'$ ,  $2'$ ,  $3'$ , &c. up to  $9'$ ; now, if the points  $9'$ ,  $18'$ ,  $27'$ , &c. which numbers decrease by unity in the units place, be made in succession points of commencement, for the arc of  $10'$  to be repeated from, they will from  $9'$  produce  $19'$ ,  $29'$ ,  $39'$ , &c.; from  $18'$  they will give  $28'$ ,  $38'$ ,  $48'$ , &c.; and from  $27'$  they will give  $37'$ ,  $47'$ ,  $57'$ , &c. and so of the rest, till all the single degrees are put on by the arc of  $10'$  thus applied from the points derived from  $9'$  and its multiples. The work is performed thus: make the opening of the microscopes again 10, by fixing the one called A at the tenth degree when zero is at the fixed one, then turn the table and superincumbent circle to be divided till the stroke  $9'$  comes to zero, then a moveable piece stuck properly under A will be  $19'$ ; bring this to the fixed microscope, and the place for  $29'$  will be had for the next stroke, under A again; and in like manner every individual degree may be marked in succession, by taking those ending with 8, after those ending with 9 have been gone through; and after that, those ending with 7, with 6, with 5, &c. till all the numerals are included. If the circle is large enough to admit of division to 5 by the opening of the microscopes, the numbers 4 and 5 may be substituted with advantage for 9 and 10, and then the opening may be  $20'$  for inserting them, instead of  $10'$ , as in the mode we have described. When half degrees are required to be inserted  $15'$  may be bisected, and the line obtained will be in the middle between  $7'$  and  $8'$ , from which stroke, with an opening of  $15'$ , all the other half degrees may be marked as before, by the aid of the adjustable marks to be transferred afterwards into the opposite semi-circle, and all the strokes in that semi-circle may then be transferred back again permanently, so as to complete the circle.

The use of the numerals nine and ten, or of the four and five, is evidently borrowed from Clavius the Jesuit, whose problem for thus dividing a right line, or arc of a circle, was published in 1611.

Another method of sub-dividing the circle, when marked

into degrees, as above described, is also proposed as being less tedious, and capable of carrying the sub-divisions to a lower denomination; thus, a socket is made to fit the arbor of the revolving table that carries the circle to be divided, so tight, that it will revolve with the said arbor, or without it, as the case may be: to this socket a telescope is fixed with a vertical hair in the focus of its eye-glass, that may bisect any distant mark to which it may be directed, then a long ruler, of six or seven feet in length, is divided, for instance, into twelve equal parts, so that it may be read distinctly; the distance of this ruler is so adjusted from the telescope, that when placed at right angles to the line of collimation, it may just subtend *one degree*, which may be first calculated nearly, and then adjusted by trial, till the run of the telescope over the twelve marks of the ruler be exactly corresponding to the run of one degree of the circle under one of the microscopes. In this situation of things, the divisions of the ruler, as seen through the telescope, are, with great care and steadiness, transferred in succession, not to one of the degree spaces itself on the circle, but to a pattern-piece of brass, which may be afterwards fixed with screws under the object lens of the fixed microscope, so as to be applied in succession to each separate degree, as the circle is made to revolve, during the operation of transferring these five minute spaces, to the opposite parts of the circle, by means of the pointil. In strictness, the ruler, viewed through the telescope, ought to be a portion of a circle; but the arc and the chord of one degree are so nearly alike, that one may be substituted for the other, without sensible error. When small circles, or parts of a circle, were proposed by the duc de Chaulnes to be divided, they were fixed on the revolving arbor of the table, and the microscopes and cutting point were so arranged, that the divisions of a large divided circle were transferred to the small one in succession, and the whole apparatus, so arranged, constituted an *engine* for dividing; but the work could not be performed with such expedition as with our modern engines, where stops are substituted for the microscopes, and where the *touch* has greatly the advantage over the *fight*. With respect to the accuracy of the work performed by the duc de Chaulnes, we are greatly inclined to believe, that the sliding mechanism of the cutting-point would not secure the strokes from having a devious direction sometimes, arising from the necessary liberty that the sliding parts must have had to admit of free motion, unless, indeed, the parts of action were fitted with extreme nicety.

Lastly, the vernier scale was retained by the author before us, as the best sub-divider of the  $5'$  spaces, or other small divisions; but he has not conceived it necessary to describe, in detail, how he proportioned it to the divisions of his circle, though it is easy to conceive how this may be done by the help of microscopes and the cutting-point. Our remark on this original method of dividing is, that it shews great ingenuity; but we conceive, that making an equality in the divided and sub-divided arcs will not always ensure perfection in the *angular measures*, because the axis of motion may be out of the centre of the divided circle, and the eccentricity will neither be detected by this method, nor allowed for in the divisions and sub-divisions, unless, indeed, two or three equidistant verniers were used for taking an average of the readings from different sides of the circle. It is somewhat remarkable that the same thought that introduced the microscopes for measuring the arcs to be divided, did not substitute them for the vernier, in reading off small quantities of a sub-division when an instrument was finished; which practice was left for Mr. Ramsden afterwards to adopt. The second semi-circle, being only the copy of a

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copy, renders this method of dividing less worthy of imitation, as an original method, than it would have been if the imperfections of the first portion of the circle had not been necessarily transferred to the other, and from that back again. In short, we think the wax-work might have been better employed.

The elder Troughton (John) whose dividing was acknowledged to be equal to that of any of his predecessors, or contemporaries, used the beam-compasses, like Bird, but rejected the computation of chords, and the measures taken from scales, as being liable to uncertainty in determining the primary points from which the bisections were to proceed. After having described his circle, or rather quadrantal arc to be divided, he determined the point 60 with the radius, as Graham and Bird had previously done, and, having bisected it at 30°, set off 30° in addition to the 60° to complete the arc of 90°; he then bisected till he had arcs of 15°, and again till he had 7° 30' in each division: the two marks nearest to 90° were now 82° 30', and 86° 15'; but the point 85° 20', or limit of the largest bifunctional arc, lay between these two, and could not be obtained by further bisections; the space between the two marks in question was therefore trisected, and the more forward of the two new points was 85°: again, the space between this mark of 85°, and that of 86° 15', was trisected; from which came 85° 25', as denoted by the more backward of the two new marks; and lastly, a fifth part of one of the sub-divided arcs was set backwards from 85° 25', to 85° 20', the point from which the 1024 divisions were inserted from 0 entirely by bisections. The quadrantal arc was then completed from the sub-divisions thus obtained. It may be necessary, however, to observe, that the marks at first made by the radius, bisections, trisections, &c. were none of them permitted to be permanent, being of no further use than to ascertain the individual point 85° 20', from which the subsequent bisections were to commence. This method is considered as being preferable to Bird's method of computing the chords and using the scale, inasmuch as it does not depend on secondary or auxiliary means of ascertaining the primary point in the bifunctional arc. It has uniformity of means to recommend it in preference to those mixed methods that depend partly on computation, and partly on the extended radius.

The method of dividing a large circle, commonly known by the appellation of *Ramsden's method*, or the method of *coaxing*, consists of Bird's method, and of that proposed by the duc de Chaulnes united: the circle is first divided by the beam-compasses into primary points; and the true situation of each of these points is ascertained by opposite microscopes, as the work proceeds, and is rectified accordingly, by pushing the points forward or backward a trifle, till they are in their true places. This method, now generally practised by all the best dividers, except the present Mr. Troughton, has not, that we know of, been very particularly described, with references to drawings, &c. though it is capable of considerable accuracy in the hands of a good workman, who has perseverance enough to do justice to it. The great number of points that will require to be rectified, will, notwithstanding the utmost precaution, render the work irregular in its appearance, and a circular line must necessarily pass through the centre of all the points or conical holes, to render them concentric; besides, the bifunctional arcs deform the conical shape of the points, by passing through them, and the subsequent erasures must leave an unevenness in the metal that cannot but offend a nice eye. Sir George Shuckburgh, in his paper on the equatorial, calls

the points that have been enlarged by rectification, and burnished level again, "doubtful or bad points;" and these bear a considerable proportion to the whole. "It would," says Mr. Troughton, "be a great improvement of this method to divide the whole by hand at once, and afterwards to correct the whole; for a dot, forced to its place, as above, will seldom allow the compass-point to rest in the centre of its apparent area; therefore, other dots made from those will scarcely ever be found in their true places. This improvement also prevents the corrected dots from being injured or moved by the future application of the compasses, no such application being necessary."

The circle that is divided by this method is placed horizontally to have its first points made, after it has had its circle described from a revolution on its own axis, and then it is placed vertically in a frame, in which it revolves, and which carries the microscopes with micrometers, that sub-divide, and read to the accuracy of one second, in order that the semi-circles, taken from any given opposite points, may have their equality ascertained, or their deviation therefrom determined previously to final rectification. In these operations great attention is paid to the temperature of all the metallic parts employed in the work.

Mr. Ed. Troughton has deviated from the beaten track of his predecessors, and made a road for himself, (probably before Ramsden's plan was adopted,) that he has trodden with great success, and which he has fully described in a paper of the Philosophical Transactions of the year 1809, which gained him Copley's medal. The reason that caused him to think for himself on this subject, as he has done successfully on many others, seems to have been this: "With as steady a hand, and as good an eye," says he, "as young men generally have, I was much disappointed at finding, that after having made two points, neat and small to my liking, I could not bisect the distance between them without enlarging, displacing, or deforming them with the points of the compasses."

This discovery led to the abandonment of the beam-compasses and spring-dividers, and, the art of turning appearing to have approached the nearest to perfection of any of the mechanical arts, a *roller* was thought of, which by its revolutions might sub-divide the circumference of a circle rolled over, after the ratio of their respective diameters was ascertained and properly adjusted. When this speculation was first attempted to be realized, some circumstances occurred which could not be certainly inferred from reasoning, *a priori*, from known data, but of which a perfect knowledge was necessary for the consummation of the project; in the first place, it was found on trial, that however smooth the surfaces of the circle and roller were made, there was no *slippery* action, as might have been expected, but the points of contact acted with each other in an apparatus like that hereafter to be described, as the teeth of wheel-work of indefinitely small dimensions; the certainty of this kind of action was an indispensable condition; secondly, notwithstanding this stability in the motion of the roller, it was found to measure different portions of the metallic circle with different degrees of accuracy, some of the measures being a trifle plus, and others minus, with respect to the truth: this want of accuracy, which, as we have said, did not depend on any sliding of the roller, was expected to take place previously, in a certain undefined degree, by reason of the unequal density of hardened materials, and of their consequent unequal *parosity*; but thirdly, though there was found to be a deviation from true measurement in individual

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dual portions of the circle, yet, when the roller was properly adjusted to measure the whole circle without a remainder, it was found to possess the desirable property of accommodating itself to the same track again, as often as the circuit was repeated, and consequently of arriving at the point zero again without the least sensible deviation. This circumstance, which may be considered as a phenomenon in mechanics, reproduced the hope of success, which the want of perfect regularity in measuring the intermediate portions of the circle was calculated to discourage: and a remedy, hereafter described, was successfully employed to equalize the measurements, nay, so exactly was the course of the roller found to be identically the same in every part of its circuit, that, when duly adjusted for diameter, the deviation at any individual point, from the first measure, would not exceed a *second*. This uniformity in the mode of the roller's travelling furnished the means of correcting its own inaccuracies of measurement, seeing that these inaccuracies, once ascertained, always remained the same at the same points of the circle, provided that zero of the roller started from zero of the circle, at the commencement of its first circuit. We cannot convey an adequate conception of the mechanical application of a roller to the division and sub-division of a circular instrument, without a reference to drawings of the apparatus actually used; nor can we describe that apparatus better than in the words of the author himself. The instrument, of which he has described the graduation, is a four feet meridian circle, at present the property of Stephen Groombridge, esq. of Blackheath.

“The surface of the circle, which is to receive the divisions,” says Mr. Troughton, “as well as its inner and outer edges, but especially the latter, should be turned in the most exact and careful manner; the reason for which will be better understood when we come to describe the mode of applying the roller: and as no projection can be admitted beyond the limb, if the telescope, as is generally the case, be longer than the diameter, those parts which extend further must be so applied, that they may be removed during the operation of dividing.” *Plates XIX and XX of Astronomical Instruments* exhibit the principal parts of the apparatus; *fig. 1.* shews the plan, and *fig. 4.* the elevation of the revolving parts of the mechanism, in both of which the same letters of reference are affixed to corresponding parts, and both are drawn to a scale of half dimensions. *AA* is a part of the circle, the surface of which is seen in the plan, and the edge in the elevation. *BBB* is the main plate of the apparatus, resting with its four feet *a, a, a, a,* upon the surface of the arc; these feet, being screws, may be adjusted so as to take equal shares of the weight, and then are fastened by nuts below the plates, as shewn in *fig. 4.* *CC* and *DD* are two similar plates, each attached to the main plate, one above, and the other below, by four pillars; and in them are centered the ends of the axis of the roller *E.* *F* and *G* are two friction wheels, the latter firmly fastened to *B,* but the former is fixed in an adjustable frame, by means of which adjustment these wheels and the roller *E* may be made to press, the former on the interior, and the latter on the exterior edge of the circle, with an equal and convenient force; namely, by the bending of the pillars of the secondary frame, and of the axis of the roller. At the extremities of the axis of the roller, and attached to the middle of the plates *C* and *D,* are two bridges, having a screw in each, by means of which an adjustment is procured for raising or lowering the roller respecting the edge of the circle, whereby the former having its diameter at the upper edge about .001 of an inch greater than at the lower edge,

on account of its being a little conical, may easily be brought to the position where it will measure the proper portion of the circle.

Much experience and thought upon the subject have taught me, that the roller should be equal to one-sixteenth part of the circle to be divided, or that it should revolve once in  $22^{\circ} 30'$ , and that the roller itself should be divided into sixteen parts, no matter whether with absolute truth, for accuracy is not at all essential here. Each of such divisions of the roller will correspond with an angle of  $1^{\circ} 24' 22.5$ , or  $\frac{1}{16}$ th part of the circle. This number of principal divisions was chosen, on account of its being capable of continual bisections, but they do not fall in with the ultimate divisions of the circle, which are intended to be equal to  $5'$  each.

The next thing to be considered is, how to make the roller measure the circle. As two microscopes are here necessary, and those which I use are very simple, I will in this place give a description of them. *Fig. 3.* is a section of the full size, and succinctly explains their construction, and the position of the glasses; but the micrometer part, and manner of mounting it, are better shewn at *H* in *figs. 1* and *4.* The micrometer part consists of an oblong square frame, which is soldered into a slit, cut at right angles in the main tube; another similar piece, nicely fitted into the former, and having a small motion at right angles to the axis of the microscope, has at one end a cylindrical guide-pin, and at the other a micrometer screw; a spring of steel wire is also applied, as seen in the section, to prevent play, by keeping the head of the microneter in close contact with the fixed frame. This head is divided into one hundred parts, which are numbered each way to fifty; the use of which will be shewn hereafter. A fine wire is stretched across the moveable frame, for the purpose of bisecting fine dots. Two of these microscopes are necessary; also a third, which needs not have the divided head, and which must have in the moveable frame two wires crossing each other at an angle of about  $30^{\circ}$ ; this microscope is shewn at *I,* *fig. 1.* In the two first micrometers a division of the head is of the value of about  $0.2$ , and the power and distinctness such, that when great care is taken, a much greater error than to the amount of one of these divisions cannot well be committed in setting the wire across the image of a well-made dot. The double eye-glass has a motion by hand, for producing distinct vision of the wire; and distinct vision of the dots is procured by a similar adjustment of the whole microscope. The first step towards fixing the roller is to compute its diameter according to the measure of the circle, and to reduce it agreeably thereto, care being taken to leave it a small quantity too large. The second step is, after having brought the roller into its place in the plate *BB,* to make a mark upon the surface of the circle, near the edge, and a similar one upon the roller, exactly opposite each other; then carry the apparatus forward with a steady hand, until the roller has made sixteen revolutions; if now the mark upon the roller, by having over-reached the one upon the circle, shews it to be much too large, take it out of the frame, and reduce it by turning accordingly: when, by repeating this, it is found to be very near, it may be turned about .001 of an inch smaller on the lower edge, and so far its preparation is completed. The third and last step is the use and adaptation of the two microscopes; one of these must take its position at *H* in *fig. 1,* viewing a small well-defined dot made for the purpose of the circle; the other, not represented in the figure, must also be fixed to the main plate of *fig. 1,* as near to the former as possible, but viewing one of the divisions on the roller with a due attention to each microscope, it will now be seen to

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the greatest exactness, when, by raising or depressing the roller, its commensurate diameter is found.

*Fig. 5.* is a representation of the apparatus for transferring the divisions of the roller to the circle. It consists of two slender bars, which, being seen edgewise in the figure, have only the appearance of narrow lines; but looked at from above, they resemble the letter A. They are fastened to the main frame, as at W and Z, by short pillars, having also the off leg of the angle secured in the same manner; Y is a fine conical steel point for making the dots, and X is a feeler, whereby the point Y may be pressed down with an uniform force, which force may be adjusted, by bending the end of the bar just above the point, so as to make the dots of the proper size. The point Y yields most readily to a perpendicular action, but is amply secured against any eccentric or lateral deviation.

The apparatus so far described, is complete for laying the foundation, *i. e.* for making 256 primary dots; no matter whether with perfect truth or not, as was said respecting the divisions of the roller; precision in either is not to be expected, nor wished; but it is of some importance that they should be all of the same size, concentric, small, and round. They should occupy a position very near the extreme border of the circle, as well to give the greatest radius possible, as that there should be room for the stationary microscope, and other mechanism to be described hereafter.

It must be noticed that there is a clamp and adjusting screw attached to the main plate of *fig. 1*, but as it differs in no respect from the usual contrivances for quick and slow motion (see CIRCLE), it has been judged unnecessary to lumber the drawing with it.

Now the roller having been adjusted, with one microscope H upon its proper dot on the circle, and the other microscope at the first division on the roller, place the apparatus of *fig. 5*, so that the dotting point Y may stand directly over the place which is designed for the beginning of the divisions. In this position of things, let the feeler X be pressed down, until its lower end comes in contact with the circle; this will carry down the point, and make the first impression, or primary dot, upon the circle; unclamp the apparatus, and carry it forwards by hand, until another division of the roller comes near the wire of the microscope; then clamp it, and with the screw-motion make the coincidence complete; where again press upon the feeler for the second dot; proceed in this manner until the whole round is completed.

From these 256 erroneous divisions, by a certain course of examination, and by computation, to ascertain their absolute and individual errors, and to form these errors into convenient tables, is the next part of the process, and makes a very important branch of my method of dividing.

The apparatus must now be taken off, and the circle mounted in the same manner, that it will be in the observatory. The two microscopes, which have divided heads, must also be firmly fixed to the support of the instrument, on opposite sides, and then wires brought to bisect the first dot, and the one which should be 180 distant. Now the microscopes remaining fixed, turn the circle half round, or until the first microscope coincides with the opposite dot; and if the other microscope be exactly at the other dot, it is obvious that these dots are 180 apart, or in the true diameter of the circle; and, if they disagree, it is obvious that half the quantity by which they disagree, as measured by the divisions of the micrometer head, is the error of the opposite division; for the quantity measured is that by which the greater portion of the circle exceeds the less. It is convenient to note these errors + or -, as the dots are found too

forward or too backward, according to the numbering of the degrees; and for the purpose of distinguishing the + and - errors, the heads, as mentioned before, are numbered backwards and forwards, to fifty. One of the microscopes remaining as before, remove the other to a position at right angles; and, considering for the present both the former dots to be true, examine the other, by the same *i. e.* as before, try by the micrometer how many divisions of the head the greater half of the semi-circle exceeds the less, and note both the quantity + or - as before, and do the same for the other semi-circle. One of the microscopes must now be set at an angle of 45° with the other, and half the difference of the two parts of each of the four quadrants, registered with their respective signs. When the circle is a vertical one, as in the present instance, it is much the best to proceed so far in the examination with it in that position, for fear of any general bending or spring of the figure; but for the examination of smaller arcs than 45°, it will be certainly far and more convenient to have it horizontal; because the dividing apparatus will then carry the micrometers, several perforations being made in the plate B for the limb to be seen through at proper intervals. The micrometers must now be placed at a distance of 22' 30", and the half differences of the parts of all the arcs of 45° measured and noted as before; thus descending by bisections to 11' 15", 5' 37" 30", and 2' 48" 45". Half this last quantity is too small to allow the micrometers to be brought near enough; but it will have the desired effect if they are placed at that quantity and its half, *i. e.* 4' 13" 7".5, in which case the examination, instead of being made at the next, will take place at the next division but one, to that which is the subject of trial. During the whole of the time that the examination is made, all the dots, except the one under examination, are for the present supposed to be in their true places; and the only thing in this most important part of the business, from first to last, is to ascertain with the utmost care, in divisions of the micrometer head, how much one of the parts of the interval under examination exceeds the other, and carefully to tabulate the half of their difference.

I will suppose that every one who attempts to divide a large astronomical instrument, will have it engraved metal. Dividing is a most delicate operation, and every coarse eye should precede it. Besides its being a most tedious and unprofitable useful to distinguish one dot from another; as in the two annexed tables of errors, the side columns give significant names to every dot in terms of its value to the nearest tenth of a degree, and the mistaking of one for another is rendered nearly impossible.

The foregoing examination furnishes material for the construction of the table of half differences, or apparent errors. The first line of this table consists of two columns; for the micrometers were at 180° distance for obtaining the numbers which fill the columns of the first and third quadrants, and at 90° for those of the second and fourth quadrants. The third variety makes one line, and was obtained with a distance of 45°; the fourth consists of two lines, with a distance of 22' 30"; the fifth of four lines, with a distance of 11' 15"; the sixth of eight lines, with a distance of 5' 37" 30"; the seventh of sixteen lines, with a distance of 2' 48" 45"; the eighth and last variety, being the real error of the table, consists of thirty-two lines, and was obtained with a distance of 4' 13" 7".5.

The table of apparent errors or half differences, just explained, furnishes data for computing the table of real errors. The rule is this; let *a* be the real error of the preceding dot, and *b* that of the following one, and *c* the apparent

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error, taken from the table of half differences, of the dot under investigation; then is  $\frac{a+b}{2} + c =$  its real error.

But as this simple expression may not be so generally understood by workmen as I would wish, it may be necessary to say the same thing less concisely. If the real errors of the preceding and following dots are both + or both -, take half their sum, and prefix thereto their common sign; but if one of them is + and the other -, take half their difference, prefixing the sign of the greater quantity: again, if the apparent error of the dot under investigation has the same sign of the quantity found above, give to their sum the common sign for the real error; but if their signs are contrary, give to their difference the sign of the greater for the real error. I add a few examples.

### Example 1.

For the first point of the second quadrant.

Real error of the first point of the first quadrant	0.0
Real error of the first point of the third quadrant	- 6.9
Half sum or difference	- 3.4
Apparent error of the dot under trial	+ 12.2
Real error	+ 8.8

### Example 2.

For the point  $45^\circ$  of the second quadrant.

Real error of the first point of the quadrant	+ 8.8
Real error of the last point of the quadrant	- 6.9
Half difference	+ 0.9
Apparent error of the dot under trial	- 8.9
Real error	- 8.0

### Example 3.

Point  $88^\circ.6$ , or last point of the third quadrant.

Real error of the point $84^\circ.4$ of the third quadrant	- 21.0
Real error of the point $2^\circ.8$ of the fourth quadrant	- 2.9
Half sum	- 11.9
Apparent error of the dot under trial	- 4.0
Real error	- 15.9

### Example 4.

Point  $88^\circ.6$ , or last of the fourth quadrant.

Real error of the point $84^\circ.4$ of the fourth quadrant	- 21.6
Real error of the point $2^\circ.8$ of the first quadrant	- 10.2
Half sum	- 15.9
Apparent error of the dot under trial	+ 9.5
Real error	- 6.4

It is convenient, in the formation of the table of real errors, that they should be inserted in the order of the numbering of the degrees on their respective quadrants; although their computation necessarily took place in the order in which the examination was carried on, or according to the arrangement in the table of apparent errors. The first dot of the first quadrant having been assumed to be in its true place, the first of the third quadrant will err by just half the difference found by the examination; therefore these are alike in both tables. The real error of the first dot of the second quadrant comes out in the first example; that of the fourth was found in like manner, and completes the first line. It is convenient to put the error of the division  $90^\circ$  of each quadrant at the bottom of each column, although it is the same as the point  $0^\circ$  on the following quadrant. The line

of  $45^\circ$  is next filled up; the second example shews this; but there is no occasion to dwell longer upon this explanation, for every one, who is at all fit for such pursuits, will think what has already been said fully sufficient for his purpose. However, I will just mention that there can be no danger in the formation of this table, of taking from a wrong line the real errors which are to be the criterion for finding that of the one under trial; because they are in the line next to it; the others which intervene in the full table not being yet inserted. The last course of all is, however, an exception; for, as the examining microscopes could not be brought near enough to bisect the angle  $2^\circ 48' 45''$ , recourse was had to that quantity and its half; on which account the examination is prosecuted by using errors at two lines distance, as is shewn in the two last examples.

When the table of real errors is constructed, the other table, although it is of no further use, should not be thrown away; for, if any material mistake has been committed, it will be discovered as the operation of dividing is carried on; and in that case the table of apparent errors must be had recourse to, indeed not a figure should be destroyed until the work is done. Respecting the angular value of the numbers in these tables, it may be worth mentioning, that it is not of the least importance; 100 of them being comprised in one revolution of the micrometer screw; and in the instance before me, 56 of them made no more than a second, it is not pretended that one of these parts was seen beyond a doubt being scarcely  $\frac{1}{2535}$  th of an inch, much less the tenths, as exhibited in the tables; but as they were visible upon the micrometer heads, it was judged best to take them into the account.

Having now completed the two first sections of my method of dividing; namely, the first which consists of making 256 small round dots; and the second in finding the errors of those dots, and forming them into a table; I come now to the third and last part, which consists in using the erroneous dots in comparison with the calculated errors, so as ultimately to make from them the true divisions.

It will here be necessary to complete the description of the remaining part of the apparatus. And first a little instrument which I denominate a sub-dividing sector presents itself to notice. From all that has hitherto been said, it must have been supposed that the roller itself will point out, upon the limb of the instrument to be divided, spaces corresponding to others previously divided upon itself, as was done in setting off the 256 points; but, to obviate the difficulty of dividing the roller with sufficient exactness, recourse was had to this sector; which also serves the equally important purpose of reducing the bisecting points to the usual division of the circle. This sector is represented in full dimensions by *fig. 2*; it is formed of thin brass, and centered upon the axis at A, in contact with the upper surface of the roller; it is capable of being moved round by hand; but by its friction upon the axis, and its pressure upon the roller, it is sufficiently prevented from being disturbed by accident. An internal frame BB, to which the arc CC is attached, moves freely in the outer one, and by a spring D is pushed outwards, while the screw E, whose point touches the frame B, confines the arc to its proper radius. The arc of this sector is of about four times greater radius than the roller, and upon it are divided the spaces, which must be transferred to the instrument, as represented on a magnified scale by *fig. 6*. Now the angle of one of the spaces of the circle will be measured by sixteen times its angular value upon the sectorial arc, or  $22^\circ 30'$ ; but this does not represent



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sent any number of equal parts upon the instrument, whose sub-divisions are to be  $5'$  each; for  $\frac{1^\circ 24' 22''.5}{5}$  is exactly  $16\frac{1}{2}$ , therefore so many divisions are exactly equal to a mean space between the dots, whose errors have been tabulated. Let therefore the arc of the sector be divided into 16 spaces, of  $1^\circ 20'$  each, and let a similar space at each end be sub-divided into eight parts of  $10'$  each, as in *fig. 6*; we shall then have a scale, which furnishes the means for making the true divisions, and an intermediate examination at every bifunctional point.

I have always divided the sector from the engine, because that is the readiest method, and inferior to none in point of accuracy, where the radius is very short; but as it is more liable than any other to central error, the adjustment of the arc by the screw E becomes necessary; by that adjustment also any undue run in the action of the roller may be reduced to an insensible quantity.

When the utmost degree of accuracy is required, I give the preference to dividing by lines, because they are made with a less forcible effort than dots are, and also, because if any small defect in the texture of the metal causes the cutter to deviate, it will, after passing the defective part, proceed again in its proper course, and a partial crookedness in the line will be the only consequence: whereas a dot, under similar circumstances, would be altogether displaced. But, on the contrary, where accuracy has been out of the question, and only neatness required, I have used dots; and I have done so, because I know that when a dot, and the wire which is to bisect it, are in due proportion to each other, the wire covering about two-thirds of the dot, the nicest comparison possible may be obtained. It may be further observed, that division by lines is complete in itself; whereas that by dots requires lines to distinguish their value.

On the upper side of *fig. 1*. is represented the apparatus for cutting the divisions. It consists of three pieces, J, K, L, jointed together, so as to give to the cutter an easy motion for drawing lines directly radiating from the centre, but inflexible with respect to lateral pressure; *d, d,* are its handles. The cutting point is hidden below the microscope H; it is of a conical form, and were it used as a dotting point, it would make a puncture of an elliptic shape, whose longer diameter would point towards the centre. This beautiful contrivance, now well known, we owe to the ingenuity of the late Mr. Hindley of York; it was borrowed by Mr. Ramfden, (see ENGINE for *dividing*.) and applied with the best effect to his dividing engine.

Previously to cutting the divisions, the parts now described must be adjusted. The cutting apparatus must be placed with the dividing point exactly at the place where the first line is intended to be drawn, and clamped, so that the adjusting screw may be able to run it through a whole interval. The microscope H must be firmly fixed by its two pillars *b, b,* to the main frame, with its micrometer head at zero; and with its only wire in the line of the radius, bisecting the first of the 256 dots. And it should be observed that the cutting frame and this must not vary respecting each other, during the time that the divisions are cut; for any motion that took place in either would go undiminished to the

account of error. The microscope I is also fastened to the main frame, but it is only required to keep its position unvaried, while the divisions of the sector pass once under its notice, for it must have its wires adjusted afresh to these divisions at every distinct course. The roller *o* has two wires, crossing each other at an angle of about  $20^\circ$ ; and these are to be placed so as to make equal angles with the divisions of the sector, which are not dots but lines. The sectorial arc must also be adjusted to its proper radius by the screw E, *fig. 2. i. e.* while the main frame has been carried along the circle through a mean interval shown by H, the sector must have moved through exactly  $16\frac{1}{2}$  of its divisions, as indicated by I.

Things being in this position, after having given the parts time to settle, and having also sufficiently proved the permanence of the micrometer H, and the cutting frame, with respect to each other, the first division may be made; then, by means of the screw for slow motion, carry the apparatus forward, until the next line upon the sector comes to the cross wires of I; you then cut another division, and thus proceed until the 16th division is cut =  $1^\circ 20'$ : now the apparatus wants to be carried further, to the amount of  $\frac{1}{4}$ ths of a division, before an interval is complete, but at this last point no division is to be made; we are here only to compare the division on the sector with the corresponding dot upon the instrument: this interval, however, upon the circle will not be exactly measured by the corresponding line of the sector, which has been adjusted to the mean interval, for the situation of the dot  $1.4$  is too far back, as appears by the table of real errors, by  $-4.8$  divisions of the micrometer head. The range of the screw for slow motion must now be restored, the cross wires of H set back to  $-4.8$  divisions, and the sector moved back by hand, but not to the division 0, where it began before; for, as it left off in the first interval at  $\frac{1}{4}$ ths of a division, it has to go forwards  $\frac{1}{4}$ th more before it will arrive at the spot where the 17th division of the instrument  $1^\circ 25'$  is to be made, so that in this second course it must begin at  $\frac{1}{4}$ th short of 0: go through this interval as before, making a division upon the circle at every one of the sixteen great divisions of the sector; and H should now reach the third dot, allowing for a tabular error of  $-10.2$ , when the division  $\frac{1}{4}$ ths of the sector reaches the cross wires of I. It would be tedious to lead the reader through all the variety of the sector, which consists of eight courses; and it may be sufficient to observe, that at the commencement of every course, it must be put back to the same fraction of a division which terminated its former one; and that the wire of the micrometer H must always be set to the tabular error belonging to every dot, when we end one interval and begin another. The eight courses of the sector will have carried us through  $\frac{1}{4}$ th part of the circle  $11^\circ 15'$ , and during this time the roller will have proceeded through half a revolution: for its close contact with the limb of the circle does not allow it to return with the sector when the latter is set back at every course. Having in this manner proceeded from one interval to another, through the whole circle, the micrometer at last will be found with its wire at zero, on the dot from which it set out: and the sector, with its 16th division, coinciding with the wires of the microscope."

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TABLE of Apparent Errors.

Name of the Dot.	First Quadrant.	Second Quadrant.	Third Quadrant.	Fourth Quadrant.	First Quadrant.	Second Quadrant.	Third Quadrant.	Fourth Quadrant.	Name of the Dot.
0.0	0	+ 12.2	- 6.9	+ 17.9	+ 4.6	+ 17.1	- 4.4	+ 17.3	1.4
45.0	- 21.3	- 8.9	16.7	- 29.6	- 5.2	- 9.7	8.9	- 6.4	4.2
22.5	1.6	2.2	1.0	2.7	0.0	3.8	1.0	4.7	7.0
67.5	+ 1.0	+ 15.6	0.0	+ 13.7	+ 1.0	+ 3.5	5.1	5.5	9.8
11.2	- 16.6	- 20.2	22.6	- 30.3	- 5.5	- 1.6	0.0	+ 1.2	12.7
33.7	4.0	4.2	13.2	23.1	7.6	7.6	4.2	- 2.3	15.5
56.2	16.9	22.2	17.0	22.7	9.4	3.9	0.0	5.3	18.3
78.7	30.8	16.6	31.3	30.3	+ 1.1	+ 12.1	+ 4.2	+ 4.3	21.1
5.6	2.7	8.6	4.1	10.1	12.3	0.9	6.2	14.4	23.9
16.9	11.5	11.3	11.2	16.1	- 5.7	- 6.2	1.1	- 11.2	26.7
28.1	9.0	7.4	5.8	14.3	+ 1.5	3.5	- 6.3	4.2	29.5
39.4	9.3	8.2	5.8	13.1	0.0	7.0	7.7	+ 1.4	32.3
50.6	4.2	6.6	8.2	4.4	1.5	+ 9.0	+ 3.0	4.3	35.2
61.9	4.3	8.4	12.5	4.4	- 8.6	- 5.9	- 2.0	- 6.7	38.0
73.1	7.6	10.0	13.6	9.7	3.3	+ 2.7	4.9	1.5	40.8
84.4	18.0	+ 6.0	16.3	7.1	+ 4.0	3.1	3.5	+ 1.0	43.6
2.8	3.4	- 7.5	8.9	2.1	13.5	10.5	+ 16.0	14.9	46.4
8.4	0.0	5.0	4.6	5.7	2.1	0.0	1.7	- 3.5	49.2
14.1	6.6	8.2	5.6	4.8	- 5.0	- 10.7	- 2.9	1.5	52.0
19.7	1.6	2.4	+ 1.0	2.5	4.2	7.9	2.2	7.2	54.8
25.3	3.7	8.2	- 2.9	2.5	4.0	3.0	2.5	1.0	57.7
30.9	+ 2.4	7.1	7.0	6.0	7.3	+ 6.2	6.1	1.5	60.5
36.6	- 5.9	+ 1.0	2.5	1.5	3.2	- 10.1	5.6	12.7	63.6
42.2	+ 3.1	1.9	5.8	+ 2.5	1.4	7.2	3.9	+ 2.2	66.1
47.8	7.1	5.2	+ 2.4	4.8	+ 11.2	+ 14.9	+ 21.2	7.2	68.9
53.4	- 5.6	- 6.0	- 5.0	- 6.1	- 7.1	- 1.0	- 8.9	- 11.7	71.1
59.1	10.7	+ 1.0	3.0	+ 1.4	5.3	1.2	6.6	2.7	74.5
64.7	7.9	- 18.0	10.7	- 9.0	7.2	9.9	+ 1.0	5.9	77.3
70.3	2.7	7.4	1.5	9.0	6.5	1.8	5.3	2.6	80.2
75.9	1.2	5.2	2.2	4.7	+ 4.4	+ 1.4	- 2.2	4.3	83.0
81.6	1.6	+ 1.7	0.0	2.0	- 20.8	- 0.0	11.4	+ 1.0	85.8
87.2	13.7	6.0	3.5	+ 5.6	+ 2.1	+ 11.0	4.0	9.5	88.6

# GRADUATION.

## TABLE of Real Errors.

Name of the Dot.	First Quadrant.	Second Quadrant.	Third Quadrant.	Fourth Quadrant.	First Quadrant.	Second Quadrant.	Third Quadrant.	Fourth Quadrant.	Name of the Dot.
0°.0	0.0	+ 8.8	- 6.9	+ 14.4	- 16.9	- 8.0	- 13.4	- 22.4	45.0
1.4	- 4.8	- 0.6	16.0	5.9	8.7	5.5	9.7	16.1	46.4
2.8	10.2	9.3	24.0	- 2.9	14.3	9.6	17.4	22.3	47.8
4.2	13.8	15.1	28.3	12.8	22.3	17.9	19.9	33.8	49.2
5.6	13.7	12.5	23.3	16.1	26.0	21.6	26.7	31.9	50.6
7.0	15.9	16.8	28.7	19.4	25.5	26.0	23.6	28.9	52.0
8.4	17.6	19.6	32.0	27.0	32.0	27.8	30.3	34.3	53.4
9.8	21.4	16.1	35.5	30.7	34.0	27.3	29.1	35.2	54.8
11.2	21.6	16.7	31.5	26.5	26.8	22.1	24.0	32.6	56.2
12.7	27.9	21.6	32.2	28.6	29.6	24.5	29.7	29.8	57.7
14.1	31.1	26.8	37.5	34.4	33.7	17.7	27.2	24.6	59.1
15.5	28.5	22.7	30.2	26.8	30.2	15.6	29.3	26.5	60.5
16.9	27.3	20.5	32.4	32.7	19.2	15.3	24.1	19.4	61.9
18.3	29.9	18.2	24.2	25.7	21.5	14.6	18.8	23.7	63.3
19.7	20.2	13.5	20.6	22.2	19.0	21.5	22.4	17.4	64.7
21.1	22.4	5.9	22.1	24.0	18.8	19.9	22.8	17.1	66.1
22.5	10.0	1.8	10.9	6.7	3.0	+ 8.2	+ 0.7	+ 2.5	67.5
23.9	8.8	12.2	16.0	14.9	9.8	- 2.8	- 2.5	- 13.0	68.9
25.3	19.8	15.5	20.2	24.0	15.7	10.2	13.7	19.2	70.3
26.7	21.7	16.1	20.0	33.0	21.9	7.0	21.8	25.8	71.7
28.1	22.1	12.8	23.8	36.4	23.0	13.9	25.1	23.0	73.1
29.5	17.1	15.8	28.9	35.0	27.1	14.3	25.3	26.8	74.5
30.9	22.1	18.0	31.4	37.0	26.6	20.1	26.6	30.7	75.9
32.3	24.7	19.3	33.3	37.7	33.3	21.1	22.7	31.1	77.3
33.7	17.4	9.1	25.1	37.6	27.9	16.0	23.8	29.1	78.7
35.2	22.7	8.0	25.1	35.7	35.5	14.5	18.5	28.7	80.2
36.6	27.3	11.9	27.4	41.8	29.3	9.0	22.4	27.3	81.6
38.0	26.5	15.6	26.9	40.6	21.0	6.6	17.5	21.4	83.0
39.4	26.4	16.7	24.8	43.1	27.5	5.4	21.0	21.6	84.4
40.8	25.4	7.2	25.1	33.6	31.0	7.9	15.4	12.6	85.8
42.2	18.5	10.4	24.7	30.2	23.0	0.1	6.8	5.2	87.1
43.6	17.3	10.0	24.6	31.7	16.3	3.7	15.9	6.4	88.6
45.0	13.9	8.0	13.0	22.4	+ 8.8	6.0	+ 14.4	0.0	90.0

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We might have quoted several other parts of Mr. Troughton's paper for the advantage of the reader, but instead thereof, we recommend the perusal of the whole to such persons as are interested in this subject, and shall conclude our account of the present method of dividing by remarking, that it requires not more than one-fourth of the time that Bird's method does, and not much more than one-twelfth that Ramsden's demands, and is applicable to a quadrant or sextant, &c.; that it may be performed by night, by the aid of an appropriate lamp, as well as by day; that the work is, as it were, magnified by the sector; that any erroneous action of the roller, when verified at every interval, does not extend its influence to any distant divisions; that the divisions of the sector very conveniently convert the 256 points into degrees and parts of a degree, while the micrometer head allows for their errors of position; that all tools liable to vary their dimensions by change of temperature are here abandoned; and lastly, that *vision* alone is employed in ascertaining the measures of the arcs divided; on which account this method is called *dividing by the eye*; which appellation, indeed, might have been given to the *duc de Chaulnes's* method; a method which, we understand, Mr. Troughton was not acquainted with till lately, and from which it will be perceived his differs very essentially. We have no hesitation in asserting, that this far excels every other method of graduating large circles that we are acquainted with.

Soon after Mr. Troughton's paper was read at the Royal Society's room, the late Henry Cavendish, esq. F. R. S., whose death is an irreparable loss to the scientific world, contrived a new method of using the beam-compass, with a view of avoiding the difficulties of pointing the exact middle of a small space between two scratches, and of using that point again without altering its conical figure. As these difficulties had led to Mr. Troughton's new contrivances, Mr. Cavendish presumed that a removal of them would render the beam-compass unobjectionable; and that future dividers might continue the use of an instrument which long habit has rendered familiar. The method proposed, but which probably has not been adopted, if tried at all, is, to unite a microscope that has got a micrometer, with the beam-compass, in such a way, that no dots may be necessary at all in dividing or sub-dividing any arc of a circle, but that bisection, trisection, and quinquesection, may all be performed by *vision* before the dividing strokes are made on the circle to be divided; we say *circle*, because this method is not intended to apply to a quadrant, or any other aliquot part of a circle. We will endeavour to explain the method now before us as concisely as possible. Let C C C, in *fig. 4. of Plate XVIII. of Astronomical Instruments*, be the circle to be divided, in which we will retain the original letters of reference, and B B B a frame resting on its plane so steadily as to be without shake, but notwithstanding to have the power of sliding smoothly round the circumference to any given point, to which it may be adjusted by a slow motion, and there clamped; let  $d\delta$  be a beam-compass, having its cutting point adjustable near  $\delta$ , and let  $m$  be a microscope with two parallel hairs, one fixed, and the other moveable by the micrometer, made so as to slide along the beam of the compass into any required situation. Let a point  $d$  on the frame be so chosen, that the line  $d m \delta$  may lie in the direction of the chord of half the arc to be bisected, when bisection is used, in which case the whole length from  $d$  to  $\delta$  must be very nearly equal to the whole chord of the said arc, and then both the centre of the field of view of  $m$ , and also the point  $\delta$ , will fall in the circle to be divided. It is not said how the fixed or central point  $d$  is

to be supported, and kept perfectly steady, but as its distance from the centre of the circle must necessarily depend on the length of the chord  $d\delta$ , it is proposed that the piece of metal that constitutes the support should be adjustable by a sliding motion of some sort, and that the beam near  $\delta$  should rest on a prop to guard the cutting point, when admitted low enough to make a stroke. Suppose now  $F$  and  $f$  to be the extreme points of an arc to be bisected somewhere near  $\phi$ ; after having placed the microscope at or near the middle of the beam, with respect to the two points  $d$  and  $\delta$ , and fixed the point on the resting place of  $d$ , slide the frame till the fixed hair in the center, which must be exactly perpendicular to the line  $d\delta$ , intersects the circle at  $F$ ; then, lowering the point  $\delta$  from its prop, make a faint scratch; in the next place turn the beam-compass a little raised at the end  $\delta$ , round its centre  $d$ , till it is found over the circle, at the other side at  $D$ , where it must rest on a prop for a time; slide now the frame forwards, and adjust till the fixed hair cuts the point  $f$ , and there fix it; the second scratch must now be made, which will be over, or short of the first, accordingly as the microscope has been beyond or short of the middle of the distance  $d\delta$ . It is not proposed to make a dot between these two strokes, but to bisect the space between with the hair, by the eye, or, if necessary, by the moveable hair of the micrometer, after it has measured the whole of this space; the bisecting line being now the true place of  $\phi$ , which we suppose brought back to the microscope at  $m$ , this intersection is the extreme point of the bisecting arc  $F\phi$  or  $f\phi$ , which must be bisected successively in like manner, when the point  $\alpha$  has been adjusted. When the arcs become small, a crooked point is proposed to be used at  $\delta$ , that it may not be in the way of the microscope; or otherwise, if that plan will not succeed, to adopt what he calls Mr. Troughton's method of bisecting an odd number of contiguous divisions, which was also done, as we have seen, by the *duc de Chaulnes* and others. In cutting the lines of division, the microscope and point  $\delta$  are proposed to be very near together, and, if possible, so near at one side of one another, that the stroke cut may coincide with the fixed hair, when the beam has an angular motion given, as a check on the stability of the microscope; and lastly, the point  $d$  must be so taken that the line  $d\delta$  may now be a tangent to the circle at the cutting point.

If the whole circle could be graduated by continual bisection, this account is all that would be necessary for explaining the method of dividing here proposed, but, as trisection and quinquesection are necessarily introduced, either before or after bisection, where the computation of chords is rejected, we must give also an account of these processes, which we believe are original. Suppose the arc  $a\alpha$ , in *fig. 5.* to be proposed for quinquesection, the equal measures  $af$ ,  $fe$ ,  $ed$ ,  $db$ , and  $ba$ , are laid down in succession, by bringing  $a$  to the microscope, and making  $f$  nearly one-fifth of the whole, then by bringing up  $f$  to the microscope, and marking  $e$ , &c. in the same way, beginning at  $\alpha$ , the points  $\beta$ ,  $\delta$ ,  $\epsilon$ , and  $\zeta$ , are made with the same extent, which it appears was with too small an opening. Now the true point of the first quinquesection from  $\alpha$  will be between  $\alpha$  and  $\beta$ , and distant from  $\beta$  just one-fifth of the differential space  $\beta b$ , and the second point will be two-fifths of  $\delta d$  from  $\delta$ , and so on for the rest; therefore, in cutting the dividing strokes, the micrometer must measure the whole differential space, and then allow for the due proportion, after which it must be brought into the place of the fixed hair, to bisect the scratch before covered by it, and then the dividing line may be cut; in the same way allowance may be made for  $\frac{2}{5}$ ths of the small space  $\delta d$ , before a second dividing stroke is made;

or,

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or, which gives less trouble, when the first quinquesection line is truly laid down, it may be transferred forward by using the fixed hair with it first, and then with the second, while the third is cutting, and so forth till they are all measured and cut in succession from the first measure repeated. This method is, however, acknowledged to be liable to the double error that may arise, first, from placing the intermediate point, and again, of sub-dividing from it. A third method for quinquesections or trisections is lastly proposed, but is considered inferior to the former plans, and therefore may be passed over in silence.

We must confess there is something specious in the theory of Mr. Cavendish's proposed method of dividing, but our opinion, that it would not answer well in practice, has been confirmed by the assertion of a practical artist, whose judgment in this art we estimate much more highly than our own. Supposing the point *d* on the frame not to be altered in shape or position by the large sweeps of the beam from right to left, and *vice versa*, alternately, nor yet the point injured, there must necessarily be a change of position in the hands of the operator, as well as in his whole body, at every backward and forward change of the beam, to the right and left, which circumstance will be not only unfavourable to expedition, but also to accuracy; in fact, the operator must be both right-handed and left-handed to succeed with an alternation of operations that require the greatest nicety of management, and in which the hands, the eye, and the diversified attitudes of the body, have all an equal share, and where a false stroke once made cannot be well rectified. The bisected arcs will not be more affected by change of temperature probably than by Bird's method, but the quinquesectioned arcs may be sensibly affected, as some time must necessarily be taken up in ascertaining the measures by vision, while the operator breathes on the beam during the inspection of the microscope, and is also handling it in two places during the whole time of obtaining the fine points, or rather lines, in question.

Soon after Mr. Cavendish's paper on the manner of dividing astronomical instruments had been read before the members of the Royal Society, the Rev. William Lax, A.M. F.R.S., Lowndes's professor of astronomy in the university of Cambridge, addressed a paper to the astronomer royal, which was also read and printed in part 2. of the year 1809, immediately after Mr. Cavendish's paper. This paper, as well as Mr. Cavendish's, was probably brought forward in consequence of Troughton's paper, printed in part 1. of the same year.

The method of examination made use of by professor Lax may be familiarly explained thus, without entering into any mathematical formulae to mark the value of particular expressions, that might puzzle the ordinary reader: two microscopes were adapted by frame-work, so as to be capable of adjustment to any given points of the circle to be examined, and one of them, having a micrometer attached to it, was capable of measuring minute differences between a given arc of 90°, 60°, or 45°, &c. and any of the following multiples of that arc taken in succession; consequently, if all the said differences marked + or -, as the case might be, balanced one another exactly, when the whole circle was gone through, the measure of the first arc was a standard measure, or the exact fraction of the whole that it ought to be; if not, a proportional part of the balance of errors would belong to it, and must be allowed for accordingly. It is not necessary to be more minute in explaining the principle of examination before us, as it is of no use in graduating a circle, but is only intended as a correction on bad graduation, like

the French repeating principle, to which it bears some analogy. The author's idea of ascertaining the fractional value of each division in his instrument successively, which he calculates will cost him an expenditure of 98 hours, is founded on an opinion that astronomical instruments in general do not possess that degree of accuracy in their divisions that the makers of them affirm; but he does not appear to be aware that as rigid an examination as his own is practised by all the best instrument-makers in the final adjustment of the divisions, and that too by means of micrometrical microscopes; so that, if a posterior examination is found necessary, it must, generally speaking, be necessary in consequence of some change of figure that the instrument has undergone from carriage, accident, or temperature; in any of which cases the professor's mode of examination will be very desirable. But any one who proposes to take the trouble of making a table of all the positive and negative errors in the divisions of an indifferent instrument, will do well to have the whole of the original paper before him at the time, by which every step in the process will be pointed out as it is wanted. Without meaning to discourage any attempt of this nature, for the proposal of which astronomers are much indebted to the learned professor, we profess a belief that three or four readings of any individual observation by as many microscopes properly arranged round the divided circle, in stationary situations, will answer every purpose of accuracy, and correct all the usual sources of error that exist at the time of making the observation; for when any table of errors is completed with the greatest care, it ought only to apply to observations made while the instrument remains in the same predicament as it was when the table was constructed. Mr. Troughton, who is engaged with the construction of his six-foot circle for the Royal Observatory, intends, we understand, to adopt the use of four microscopic readings, two opposite each other, which will correct for eccentricity simply considered, and two at 120° distance from one of the former ones, which will check the bisecting dividing, and correct the inaccuracies of division, if any, as well as the effects of any change of figure in the circle by unequal temperature, in the room where it may be used. This proposal, coming from so skilful and experienced an artist as Mr. Troughton, we consider as a strong argument in favour of our opinion, which we expressed in favour of three readings in our article CIRCLE, before the paper in question was published, or known to us.

"I find," says Mr. Lax, "that I can read off, to a certainty, within less than three-fourths of a second, and hence I conclude that I could examine the divisions of my circle (of one foot radius) without being liable to a greater error than 9.63 seconds." This is stated on calculation to be the extreme limit; which, according to the doctrine of chances, can very seldom happen, but if one-half of this error is likely to happen in any one division of the whole circle, as read off by the microscopes, the result will be, that the errors of the table may be as great as those of a well-divided instrument, supposing it to preserve its figure unaltered after examination. In another part of the paper before us, the author says, "we may likewise observe that by this examination we shall not only be secured against the errors of division, but against those which arise from bad centering, and from the imperfect figure of the circle, and which in general are of too great a magnitude to be neglected." From this observation we must necessarily conclude, that the distance between the microscope and micrometer, used in measuring, was not the measure of the included arc, but of the angular quantity at the centre opposite that arc: for it must be evident, that, in case the axis of motion is not precisely the centre

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of the divided circle, the *arc*, simply considered, will not be the true measure of the *angle*, being one side of the circle will be farther from the centre than the other. For instance, if we suppose the line that passes from zero to the centre of the divided circle, should also pass through the centre of motion, placed a small quantity out of the centre of the graduated circle, in this case the angles subtended by the first and fourth quadrantal arcs will be greater than those subtended by the second and third; but if the line from 90 to the centre of motion should pass through the centre of the divided circle, then the angles subtended by the first and second quadrantal arcs will be greater than those subtended by the third and fourth. When, however, the microscopes have a cross hair, as well as a radial one, the length of the *radius* as well as of the *arc* may be measured, and consequently the true quantity of the subtended angle.

The great similarity between the duc de Chaulne's method of dividing a circle, and of professor Lax's method of examining one when divided, cannot but strike the reader; they both use microscopes, one with a micrometer attached, and both take multiples of the arc under consideration; but one corrects the errors by adjustment during the act of dividing, and the other calculates and tabulates them for subsequent corrections.

Neither will the likenesses pass unnoticed between the apparatus employed by Mr. Lax, and that for the purpose of examining standard measures, described by sir Geo. Shuckburgh (Phil. Trans. 1758); but Mr. Troughton, we know, acquits the learned professor of borrowing any thing from him.

In the spring of 1810, Mr. James Allan, of Blewitt's Buildings, Fetter Lane, London, received the gold medal from the Society of Arts, at the Adelphi, for a new method of equalizing the teeth on the edge of an engine plate for dividing sextants, &c, which would have been described most properly under the article ENGINE, but as it was not then made known, we will take some notice of it in this place, though the Society's account is not yet published. The professed improvement of Mr. Allan's method of racking, consists in its enabling a bad divider of a circle to correct his divisions, by what he calls a *self-correcting* process. The contrivance is this: the usual wheel or circular plate that is racked, has a brass rim of about two inches breadth, and of the same diameter and thickness as the wheel, rabbeted over it, so as to appear a part of the same wheel; four steady pins, at the exact distance of a quadrant from each other, keep the rim in its place by the aid of several equidistant screws, and the rim will therefore admit of four positions on the wheel. When the wheel and rim together have been faintly racked in the usual way (see ENGINE by Ramsden) one of the other positions is given to the rim, suppose the opposite one, and then the operation of racking by the screw is resumed; when the teeth are a little formed, another position is given to the rim, and the racking resumed as before to a certain extent, and, after several changes have been gone through, it is presumed that the teeth become nearly equalized, and are exactly equal to one another at the conclusion. How far this will be precisely the case we will not pretend to assert. We conceive it to be a very nice operation to drill four holes in the wheel and rim so exactly equidistant and concentric, that a reversed position shall not affect their relative fittings, and if there is the least deviation in this respect, it will be charged as an error on the divisions. The screws also profess to be placed so as to admit of reversing in position,

and unless the steady pins fill their holes completely, these pins will, in all probability, be drawn aside by the fixing screws in some of the positions. If the wheel is truly racked in the first instance by a careful divider, and the steady pins placed with precision, the reversing of the rim will not disturb the coincidence of the two rows of teeth all round, which is the thing ultimately desired; but if the original division was bad, and had both negative and positive deviations from true division, in different parts of the circle, then we have a doubt whether the rim will produce the desired effect of equalizing them: a good screw will of itself equalize contiguous teeth, when fifteen teeth or upwards are acted on at the same time; but it will not equalize distant teeth, which the rim professes to do. In order, however, to answer the purpose of a *self-corrector*, the rim must be competent to meet all cases of bad division that are liable to occur; let us suppose, in the first place, that whenever large teeth are made by the divider on one side of the wheel, teeth corresponding in smallness are to be met with at the opposite side, in this case, which is the most favourable to the operation of the rim, the errors being opposed to each other, by an opposite position of the rim, will correct each other, provided they are of similar quantity, and the rim will produce its desired effect; but, secondly, if equal errors happen to be in the same direction they will not be corrected at all; and, thirdly, if unequal errors be in the same direction, they will be corrected by only half their difference; nay, arcs of the wheel, that are true at first, will, we conceive, be vitiated, unless they fall in with arcs of the rim that are also true. How far a change of temperature will affect this long process we will not affirm; but we hesitate not to give it as our opinion, that an upper plate, or wheel, revolving on the same centre as the wheel itself, would be less liable to central error than the rim with steady pins, however carefully fixed; for steady pins could not then cause any sensible eccentricity in fixing at the different positions.

It would have been desirable if Mr. Allan had given, with his account of the racking, his method of making a perfect screw, which is essential in a dividing engine. We lately had an opportunity of examining one of his engine-divided reflecting circles, and found, however, the opposite verniers very well corresponding with each other all round the circumference.

*GRADUATION of a Circle geometrically.* After the description we have given in our preceding article of the various practical methods of graduating astronomical instruments, it may, perhaps, seem superfluous to give a further account of the methods that geometers have proposed for graduating a circle theoretically; but which have been of little or no use in the practical division of circles, or circular arcs, on instruments. It is not sufficient for the purpose of the instrument-maker, that a problem be true merely, but that the means necessary for its adoption in practice be not subject to the introduction of error. The ancient geometry implies the possibility of making a straight line in practice through two given points, which cannot be effected with certainty by a ruler and pointed tool, however carefully applied, while the modern geometry of Mascheroni, the Italian, rejects the use of lines altogether, and substitutes the compasses only in the division of a circle. We will gratify the curiosity of the reader with a few specimens of each method in succession.

In Adam's geometrical and graphical essays are the following problems, which imply the practicability of drawing a straight line through two given points.



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## PROBLEM I.

“To cut off from any given arc of a circle a third, a fifth, a seventh, &c. odd parts, and thence to divide that arc into any number of equal parts.”

*Example 1.*—To divide the arc  $AKB$  into three equal parts,  $CA$  being the radius, and  $C$  the centre of the arc. Bisection  $AB$ , *fig. 1.* of *Plate XXI.* of *Astronomical Instruments*, in  $K$ , draw the two radii  $CK$ ,  $CB$ , and the chord  $AB$ ; produce  $AB$  at pleasure, and make  $BL = AB$ ; bisection  $AC$  at  $G$ ; then a rule on  $G$  and  $L$  will cut  $CB$  in  $E$ , and  $BE$  will be  $\frac{1}{3}$ , and  $CE$   $\frac{2}{3}$  of the radius  $CB$ ; on  $CB$  with  $CE$ , describe the arc  $Eed$ ; lastly, set off the extent  $Ee$  or  $De$  from  $B$  to  $a$ , and from  $a$  to  $b$ , and the arc  $AKB$  will be divided into three equal parts.

*Corollary.*—Hence, having a sextant, quadrant, &c. accurately divided,  $\frac{1}{2}$  the chord of any arc set off upon any other arc of  $\frac{1}{2}$  that radius will cut off an arc similar to the first, and containing the same number of degrees. Also,  $\frac{1}{2}d$ ,  $\frac{1}{3}d$ ,  $\frac{1}{4}d$ , &c. of a larger chord will constantly cut similar arcs on a circle whose radius is  $\frac{1}{2}d$ ,  $\frac{1}{3}d$ ,  $\frac{1}{4}d$ , &c. of the radius of the first arc.

*Example 2.*—Let it be required to divide the arc  $AKB$ , of the same figure, into five equal parts, or to find  $\frac{1}{5}$ th of the arc  $AB$ .

Having bisected the given arc  $AB$  in  $K$ , and drawn the three radii  $CA$ ,  $CK$ ,  $CB$ , with radius  $CI$  describe the arc  $INM$ , which will be bisected in  $n$  by the line  $CK$ ; then take the extent  $In$ , or its equal  $Ma$ , and set it off twice from  $A$  to  $B$ ; that is, first from  $A$  to  $a$ , and then from  $a$  to  $o$ , and  $oB$  will be  $\frac{1}{5}$ th of the arc  $AB$ . Again, set off the same extent from  $B$  to  $m$ , and from  $m$  to  $c$ , and the arc  $AB$  will be accurately divided into five equal parts.

*Example 3.*—To divide the given arc  $AB$  into seven equal parts.  $AB$  being bisected as before, and the radii  $CA$ ,  $CK$ ,  $CB$ , drawn, find (by a problem referred to) the seventh part  $PB$  of the radius  $CB$ , and with the radius  $CP$  describe the arc  $P r N$ ; then set off the extent  $P r$  twice from  $A$  to  $3$ , and from  $3$  to  $6$ , and  $6B$  will be the seventh part of the given arc  $AB$ ; the compasses being kept to the same opening  $P r$ , set it from  $B$  to  $4$ , and from  $4$  to  $1$ ; then the extent  $A 1$  will bisect  $1 3$  into  $2$ , and  $4 6$  into  $5$ ; and thus divide the given arc into seven equal parts.

It is obvious, that this method of dividing any portion of a circle, into an odd number of equal parts, is subject to three sources of error in practice; 1st, the variation of the compasses from expansion; 2d, the uncertainty of getting the exact points of intersection where the angles are acute; and 3dly, the probable deviation of the points in stepping; to say nothing of the errors arising from drawing the right lines, which would, in all probability, exceed all the other errors put together, even before they are doubled and trebled, &c. by stepping.

## PROBLEM II.

“To divide a given arc of a circle into any number of equal parts by the help of a pair of beam, or other compasses, the distance of whose points shall not be nearer to each other than the given chord,” (by Clavius).

Let  $AB$ , *fig. 2.* of *Plate XXI.* be the given circular arc to be divided into a number of equal parts. Produce the arc at pleasure; then take the extent  $AB$ , and set it off, on the prolonged arc, as many times as the given small arc is to be divided into smaller parts, namely, to the points

$C, D, E, F,$  and  $G$ . Divide now the whole line  $AG$  into as many equal parts as are required in  $AB$ ;  $G H, H I, I K, K L, L A$ , each of which contain the given line, or one of those parts into which the given line is to be divided. For  $AG$  is to  $AB$ , as  $AF$  to  $A B$ ; in other words,  $AG$  is contained five times in  $AG$ , as  $AB$  is in  $AF$ ; therefore, since  $AG$  contains  $AF$ , and  $\frac{1}{5}$ th of  $AB$ ,  $BL$  is  $\frac{1}{5}$ th of  $AB$ . Then, as  $GH$  contains  $AB$ , plus  $FI$ , which is  $\frac{1}{5}$ th of  $AB$ ,  $I I$  will be  $\frac{1}{5}$ th of  $AB$ ,  $DK$  this, and  $C I$  this. Therefore, if we set off the interval  $GH$  from  $F$  and  $H$ , we obtain two parts between  $F$  and  $I$ ; the same interval, or extent, set off from these two points near  $L$ , gives three parts between  $D$  and  $K$ ; when set off from the points from  $D$  to  $K$ , it gives four parts in  $CL$ ; and the next transfer will, from those points, give five parts from  $B$  to  $A$ ; so that, lastly, the same extent will give back again the remaining divisions in fact, and from there between  $B$  and  $C$ .

This method is liable to some of the same sources of error as the preceding method, when comparisons are depended on; but it is useful, according to the *de Chaulne's* mode of proceeding, and may be serviceable in Ramsden's method of dividing, where the points are rectified by opposite microscopes. In all probability the vernier scale owes its origin to this problem of Clavius, which problem may be variously diversified, to prevent the necessity of small extents; but whenever small spaces are marked out on an arc by a differential plan of this sort, it is requisite that the extent begun with should not alter during the whole process, and also that the points, once marked, should be capable of being resumed with certainty at the subsequent transfer. When, however, an error is made in dividing space by a hard particle, or otherwise, the error will recur at every multiple of the extent measured therefrom.

This problem of Clavius, it will be remarked, implies the given arc  $AB$  to be measured, or otherwise known previously to the proposed sub-division.

When an entire circle is proposed to be divided into degrees, the radius, which is equal to the chord of  $60^\circ$ , affords the means of making six equal arcs; and these arcs may be sub-divided to arcs of  $15^\circ$  each by bisection only; but to reduce the equal arcs to a still lower denomination, recourse must be had to either trisection, quinquesection, computation of the chords, or the differential method originally proposed by Clavius, all which have been already described.

The method of dividing a circle, proposed by L. Mafcheroni, is translated into French by A. M. Camus, 1758, and is contained in the second book of his “*Geometrie du Compas.*” This method rejects not only the drawing of lines, but all measurement from scales, and bisections of an arc by trial, as well as trisections, quinquesections, &c. but admits of stepping, and supposes the extent of a pair of compasses, once taken, to be afterwards invariable. The radius of the circle is the basis of all the other extents, which are very few in number, considering the various divisions that may be made therewith, and three points determined, one without and two within the circle, afford the means of taking all the measurements, instead of a scale; consequently, any circle divided by this method must necessarily have its plane extended considerably beyond and within the circular space to be divided, which is seldom the case in a large instrument, where a ring or rim is attached to radial bars, to form a wheel for the body of the instrument, which construction contributes equally to strength and lightness; a

## GRADUATION.

flat sheet of metal, which the present method of dividing requires, is seldom, if ever, adopted in the construction of an instrument of considerable radius. The second book of the "Geometry of the Compass," which has not yet been translated into English, and which therefore may not be known to many of our readers, contains ten problems on the division of the circumference of a circle, and one on the manner of bisecting an arc by a new process, that makes no superfluous marks, and requires no second trial: these problems are accompanied by demonstrations and corollaries, that would enlarge our article too much, were we to translate them entirely, but we will give so much of the substance of these problems, as will enable the reader to comprehend the nature and extent of the division in question, which we apprehend will be deemed more curious than useful. The ten problems divide the circle into the following parts, according to the order in which they here succeed one another, *viz.* 4, 8, 12, 24, 48, 5, 10, 120, 20, and 240. Let *fig.* 3, of *Plate XXI.* be a diagram for illustrating the four first divisions or problems. Let one beam, or other kind of compass, describe the circle with the extent *BA* from the centre *A*, and let this compass have its extent preserved unaltered, to represent the radius, and be called the first compass; with this extent and beginning at *B*, as zero, turn over to *C, D, E, d, e*, and back to *B* again; now if this is accurately done, *BAE* will bisect the circle, *BDd* will trisect it, and the six original points will divide it into six arcs of 60° each; take now *BD*, the chord of 120° in the second compass, and preserve this extent unaltered; from zero *B* and its opposite point *E*, bisect the point *a* out of the circle, with this extent; then will the distance *aA*, taken in a third compass, and kept unaltered, be the chord *BF* of 90°; also of the arc *EF*, of *Ef*, and of *fB*; the circle is now divided into four quadrants at the points *B, F, E*, and *f*. To obtain an eighth part of the circumference, set *A B*, by the compass *N° 1*, from the point *a*, out of the circle, to *G* and *H* in the arc on each side; then the semi-circle is divided into four, and the points *g* and *h*, in the other semi-circle, may be transferred from *G* to *g*, and from *H* to *h*, with the compass *N 3*, or chord of 90°, and the whole circle will now be divided into eight equal arcs by the points *B, G, F, H, E, h, f, g*.

To gain twelve equal arcs of the circle, with *N° 1*, or extent equal to radius, from *F* as the first point turn over to *N*, and *n*, in succession one way, and to *O* and *o* in succession the other; and the whole circle will be divided into twelve equal arcs by the points *B, N, C, F, D, O, E, o, d, f, c, n*. To double this number of equal arcs, begin at *G* with the same extent of radius, and step to *L* and *M* one way, and to *k* and *i* the other; also from *H* with the same extent step to *I* and *K* one way, and to *m* and *l* the other way, which points will bisect the former twelve arcs, and make the whole 24. Hitherto we have had occasion for no other point but *a* for determining the 24 arcs, and it is somewhat remarkable, that the three extents ascertained thereby, *viz.* the radius, the chord of 90°, and the chord of 120°, are to each other in the simple ratio of the square roots of 1, 2, and 3 respectively. In order to sub-divide, without trial, the 24 arcs into 48, another point *e* within the circle is necessary; with a fourth compass take the extent *aN*, and find the point *e* by intersection from *B* and its opposite point *E*; then *N 1*, or radius, will cut the circumference from this point *e* in the points  $\mu$  and  $\nu$ ; so shall *K \mu, \mu N, M \nu*, and  $\nu O$  be each equal to the 48th part of the whole circumference. To divide the circumference into five equal parts, a third point *b* within the circle, and in the same diameter with *e*, but at the opposite side of the centre, will be

necessary: to avoid confusion from further sub-division, we will take another *fig.* (4) with similar letters of reference as the preceding one. With *N 3*, or extent *aA* of 90°, intersect at the point *b* from the points *N* and *O*, then with a fifth extent *Bb* set off from *B* to *Q*, and the arc *BQ* will be the fifth part of the circumference. To bisect these five large arcs, take the sixth extent *Ab* and set it from *B* to *P*, which will be equal to the arc *PQ*, and, consequently, will be a tenth part of the circumference. Again, without any further operation, the small arc *QI*, already marked, will be the 120th part of the circumference; and to obtain  $\frac{1}{24}$ th part of the same, in the quadrant *BVf*, the fifth extent *Bb*, set off from *f* to *V*, will leave the arc *BV* equal to this quantity. And lastly, to procure 240 equal arcs, take the extent  $\pi$ , and set it over from  $\delta$  to  $\xi$ , and from  $\beta$  to  $\gamma$ , so shall the arc *P\delta* be the  $\frac{1}{240}$ th part of the circumference; but to subdivide all the circumference by the small arc *P\delta* of 1° 30', the arc *NG* of 15° must first be divided into five parts of 3° each, without quinquesection; thus, with the extent *Ab = BP*, step from *B* to the points *P, Q, R, S*, and it will fall next in *E* already marked; then with *Ab*, as before, begin at *L* and put in the points *q* and *p* successively; also from *I* put in  $\pi$ ; and from *O* put in  $\rho$ , by stepping the points  $\xi, \gamma$ , and  $\delta$ ; thus shall the points  $p, P, \pi$  and  $\rho$  sub-divide the arc *NG* into five equal arcs, and  $\delta\pi$  will be found equal *P\delta*, or  $\frac{1}{240}$ th part of the whole. After having obtained these five sub-divisions of 3° and 1° 30', the first may be transferred, with the extent *NG* for instance, into other arcs of 15° in succession, beginning with *GC* first, and using the points *N, p, P*, &c. as they occur, till the whole is gone through, after which the small arcs thus transferred may be bisected by an extent  $\delta N$ , going a second time over the same points in succession as before. Thus will the whole circumference be sub-divided into 240 parts of each 1° 30'.

The eleventh or last problem on this subject, is to divide any arc *BC* (*fig.* 5.) into two equal parts in *G*. To do this; with radius *AB*, which has described the arc *BC* to be divided, and from the centres *B* and *C*, the two extremities of the arc, let the arcs *AD* and *AE* be described; let *AD* and *AE* be each made equal to *BC*; then from the points *D* and *E*, as centres, and with radius *DC* or *EB*, find by intersection the point *F*; lastly, with the radius *AF*, and from the centres *D* and *E*, let the point *G* be intersected, which will fall in the circumference, if the operation is truly performed, and will also bisect the arc *BC* as was required.

By the help of the three remarkable points *a, e*, and *b*, in our *fig.* 4, the author of the *Geometry of the Compass*, has laid down in his twelfth and last book a dozen equations, some one of which may be applied to determine, by approximation, almost any small arc of a circle that shall cut off a given quantity. It would be tedious to enter here minutely into his various calculations, but, for the sake of amusing the reader, we will select the solutions of a few problems, without the annexed demonstrations, which would enlarge our article too much.

### PROBLEM I.

*To find the arc of one degree without the error of half a second.*

*Solution.*—Let the arc *Bz*, below *B*, be 55° 30', (in the circle which has been divided into 240 parts of each 1° 30') take the distance *bx'*, and from the point *e*, as a centre, describe an arc to cut the circumference in some point *Z'*, and the arc *BZ'*, above *B*, will be 52° 59'  $\frac{1}{2}$ °, or 53° within about 25''; then in the divisions between *B* and *F* is the  

division

division  $54'$ , or  $\frac{1}{2}$  of the whole circle; there will therefore be  $54' - 53' = 1'$  by approximation within the required degree of accuracy.

*Solution 2.*—Let the arc BZ be taken =  $10^\circ 30'$ , (by the divisions existing) from the centre  $a$ , and with the distance  $bZ$  as radius, cross the circumference in the said point  $Z' = 29^\circ 29' \frac{2}{3} \frac{1}{4}$ , or  $29^\circ 30'$  without an error of half a second; then look for  $28^\circ 30'$  in the existing divisions, *viz.*  $\frac{1}{3} \frac{2}{3}$  of the circle, and the difference will be very nearly as before =  $1'$ . This solution is less accurate than the former by about  $4''$ ; the error being  $29''$ .

## PROBLEM II.

*To find an arc of  $15'$  without an error of  $1''$ .*

*Solution.*—Take the arc Bz =  $12^\circ$  below B, the distance  $cz$  will be the chord of  $87^\circ 15'$ ; with a radius of this extent, and from B, as a centre, cut the arc BF above, in the point  $Z'$ , and the arc BZ' will be  $87^\circ 15'$ ; but among the existing divisions of the arc is  $87^\circ$ , or  $\frac{2}{3}$  of the circumference; therefore, the difference of the two arcs is =  $15'$ .

## PROBLEM III.

*To find an arc of  $10'$  without an error of  $10''$ .*

*Solution.*—Take the arc Bz downward =  $49^\circ 30'$ , and the distance bz will be the chord of  $38^\circ 50'$ , without an error of  $10''$ ; then, the division  $39^\circ$ , or  $\frac{1}{3}$ , being found already, their difference on the circumference taken from B upwards, will be an arc of  $10'$ .

## PROBLEM IV.

*To find an arc of  $6'$  within  $13''$ .*

*Solution.*—Take the chord of  $45^\circ$  from B to G above, and from the point  $b$  cut the circumference at  $z$ , which will be at  $40^\circ 6'$ , downwards from B, without an error of  $13''$ , but  $40^\circ$  counted downwards already exists, therefore the small arc between is  $6'$ .

## PROBLEM V.

*To find an arc of  $1'$  within  $22''$ .*

*Solution.*—Let Bz downwards be =  $27^\circ$ ; from the point  $c$  as a centre with radius  $bz$ , cut the circumference above at  $Z$ ; and the arc BZ will be  $29^\circ 59'$ , with an excess of  $22''$ ; therefore, the arc BN being  $30'$ , the arc ZN will be  $1'$  within  $22''$ .

By such means as these an arc of  $9'$  within  $7''$  is determined; also, an arc of  $20''$  within  $1''$ ; an arc of  $15''$  within  $10''$ ; an arc of  $12''$  within  $1''$ ; an arc of  $10''$  within  $1''$ ; and an arc of  $5''$  within  $2''$ ; but these last arcs are so minute in all ordinary circles, that we omit the solutions, as being of no utility.

We have hitherto supposed the circle divided into  $360^\circ$  with their sub-divisions, but the French have proposed a centesimal division of the circle to be substituted, where each quadrant has  $100^\circ$  instead of  $90^\circ$ , making  $400$  in the whole circle, with each degree sub-divided by hundreds, &c. This mode of dividing has been exemplified by L. Mascheroni, in his *Geometry of the Compass*; and Mr. Troughton has described the method of graduating a circle in this way by his method, if it should ever prevail in England; but, as there appears to be no advantage to the divider in affording bisections lower than  $25'$ , and as our tables of logarithms, as well as astronomical tables, are adapted to the existing mode of dividing the circle, we are unwilling to lend our

aid to the introduction of useless innovations, by entering more minutely into the subject.

L. Mascheroni is the Italian geometrician, we are informed, who taught Bonaparte some problems, when in one of his campaigns in Italy, with one of which he puzzled the French mathematicians, and gained the reputation of being an adept in mathematics.

**GRADUATION**, in *Mineralogy*. When a mineral is discovered which is intermediate between other known species, and in different specimens, or parts of the same specimen, approaches very near to such known minerals, it is said to *graduate*, pass into, pass over to, or make transitions to, such minerals. Frequently, the strata of the earth graduate thus into each other, so that it is extremely difficult to define where one stratum ends and another of very different properties begins: these graduations are not uncommon between some lime-stone strata and the chert beds in them. More frequently, each stratum is separated by a thin layer or way-board of pulverulent matter, which occasions the strata to part freely; and often, in such cases, the parts of the strata in contact with these way-boards differ nothing from the general mass of each stratum, or there is no graduation between one stratum and the next in succession.

**GRADUATION of saline Liquors**, in *Chemistry*, is a method of concentrating weak saline solutions, by pouring them through a heap of faggots, and exposing them in this divided state to a free current of air. See **MURIATE of Soda**.

**GRADUS GEMONIC**. See **GEMONIÆ**.

**GRÆA**, Γραία, a name used by the old Greek writers for the wrinkled pellicle which arises upon milk in the boiling.

It was also used in a figurative sense for the wrinkles in the skin of old people.

**GRÆCIA**, GREECE, in *Ancient Geography*, a country of considerable extent, forming, as it were, the boundary or frontier between Europe and Asia, and comprehending a great number of different states and kingdoms. We have various opinions as to the etymology of the appellations Græci and Græcia. The most prevalent opinion traces the origin of these terms to Graicus or Græcus, the father, as some say, but, according to others, the son of Theffalus, who gave its name to Theffaly. Salmatius supposes the name Græcus to be derived from Ragau or Rau, the son of Peleg, the fourth in descent from Shem, the son of Noah, by the transposition of a letter in order to soften the sound. Pezron deduces it from Graia, signifying in Celtic *ancient*, and applicable to the Grecians by way of contradistinction to more modern people. But it has been objected to this etymology, that the Pelasgi and Hellenes were a more ancient people than the Greeks. M. de Gebelin supposes the origin of the appellation to have been the word *græ*, *græ*, denoting vast or immense, in reference to the sea which terminated the Adriatic gulf, on the borders of which the Greeks migrated southwards, whence he derives *Ræmus*, signifying this sea, and by prefixing the guttural G to the singular R, *Græmus*. The Greeks were also called Achæans, Hellenes, and Pelasgi. The first of these appellations is supposed to have been derived from Achæus, the son of Xuthus, the son of Hellen, and father of Ion; the second from Hellen, just mentioned, the son of Deucalion, and father of Dorus, from whom sprung the Dæmons; and the third, from a pretended founder Pelasgus, who, taking possession of the Peloponnesus, occasioned its being denominated Pelasgia. Grotius, Salmatius, and Stillingfleet,

names of considerable authority in disquisitions of this nature, suppose that the descendants of Peleg, the fourth in descent from them, the son of Noah, whom they suppose to have been the father of the Scythians, were the first who peopled Greece; and that they only softened the name of Peleg, or Phaleg, their progenitor, and called them Pelasgians. But Bochart (in his "Phaleg") shews, that both Phaleg and Ragau, and their descendants, remained in the confines of Media and Armenia; and that the Scythians were the descendants of Magog, and not of Phaleg or Ragau. Some have asserted that the most ancient name of all is that of Iones, which the Greeks themselves derive from Xuthus, grandson to Deucalion. Josephus asserts (Ant. l. i. c. 7.) that their original is of much older date; and that Javan, the son of Japhet, and grandson of Noah, and his descendants, were the first who peopled these countries; and in proof of this position the learned Bochart has alleged several strong presumptive arguments. He first adduces the authority of Josephus, just cited: he then appeals to the name of the patriarch, יָוֶן, which, without the points, sounds more properly Ion than Javan; he next alleges the authority of Moses, who says (Gen. x. 5.) that "by these" (the sons of Japhet) "were the isles of the Gentiles divided;" which, according to the genius of the Hebrew, mean, not islands properly so called, but all maritime countries, at any distance from Palestine, especially those which are along the Mediterranean; and he also refers to the prophets (Is. cap. ult. v. 19. Dan viii. 21. x. 20) who call Græcia by the name יָוֶן, Ion, or Javan, and hence the Jews have always called the Greek tongue יִבְרִיתִי, Javanith. To these arguments he adds that the clear remains of Elisha, Javan's eldest son, are still to be found in that of Elis, one of the ancient kingdoms of the Peloponnesus.

GRÆCIA, or *Ancient Greece, Geography of.* Exclusively of the provinces of Epirus and Macedonia, which long remained barbarous and uncultivated, the continental possessions of the Greeks (says Dr. Gillies,) were nearly equal to Scotland in extent. In its length, comprehended between the 36th and 41st degrees of N. latitude, the whole country is almost equally divided by two opposite gulfs, compressing between them a mountainous neck of land, to the breadth of only five miles, into the peninsula of Peloponnesus, and the territory extending northwards, from the extremity of the Corinthian isthmus to the southern frontier of Macedonia. The Peloponnesus, 160 miles in length, and scarcely 100 in breadth, is every where intersected by mountains, particularly the towering ridges of Zarex and Taygetus. During the flourishing ages of Greece, this small peninsula contained seven independent communities of un-

equal power and fame, which ranked in the following order: the comparatively large, and highly diversified, territory of Laconia; the fruitful vale of Argos; the extensive coast of Achaia; the narrow but commercial isthmus of Corinth; the central and mountainous region of Arcadia; together with the more level countries of Elis and Messenia, which are throughout better adapted to tillage, than any other provinces of the Peloponnesus. The Grecian possessions beyond the isthmus of Corinth were more considerable, extending above 200 miles from east to west, and 150 from north to south. They were naturally divided by the long and intricate ridges of Olympus, Pindus, Oeta, and Ossa, into nine separate provinces; which, during the celebrated ages of Grecian freedom, were occupied by nine independent republics. They comprehended the extensive and fertile plains of Thessaly and Bœotia, both of which were, in early times, much exposed to inundations, and the latter, abounding in subterranean caverns, was peculiarly subject to earthquakes; the less fertile, but more secure territory of Attica; the western provinces of Ætolia and Acarnania, encompassed on one side by dangerous seas, and confined on the other by almost impassable mountains; and the four small rocky districts of Phocis, Doris, Locris, and Megara.

These names and divisions (says the above cited historian) which remained to the latest times, are pretty accurately marked by Homer, whose poems continued, through succeeding ages, to be the approved standard and legal code, to which neighbouring communities appealed, in adjusting their disputed boundaries. This qualification, however, must be admitted with two exceptions. During the Trojan war, the extensive province of Thessaly sent forth above a fourth part of the whole Grecian strength, and was divided among many warlike leaders. But when commerce, navigation, and the mechanic arts, enriched and adorned the middle and southern divisions of Greece, the northern district of Thessaly lost its ancient pre-eminence. The other exception arose from the extensive power of the house of Pelops, which had, by fortunate marriages and rich successions, acquired dominion over the northern and eastern parts of the Peloponnesus, formerly containing several independent principalities, and, after the misfortunes of Agamemnon and his family, again divided into the immortal republics of Sparta, Argos, Corinth, and Achaia. The following table will exhibit at one view the principal states of Greece, with some of their towns and rivers, referring to each article for a further account, and observing that we have admitted into it Macedonia, though it was not properly a province of Greece till after the reign of Philip, or rather that of Alexander, and also Epirus and Illyria.

G R Æ C I A.

TABLE

*Of the Principal Geographical Divisions of Greece.*

Natural Divisions of GRÆCIA, or Greece.

PELOPONNESUS.	ARGOLIA.	{ Rivers.— <i>Inachus, Erasinus.</i> { Towns.—ARGOS, <i>Mycenæ, Epidaurus, &amp;c.</i>	
	LACONIA.	{ R. <i>Eurotas.</i> { T. SPARTA, <i>Anycle, Gythium, Teucrium.</i>	
	MESSENIA.	{ R. <i>Pamifus.</i> { T. MESSENE, <i>Stenyclarus, Colonidas.</i>	
	ELIS.	{ R. <i>Alpheus, Anigrus, Sellis.</i> { Div. <i>Triphylia, Pisatis, Cæle-Elis.</i> { T. <i>Olympia, Pifa, ELIS.</i>	
	ACHAIA.	{ R. <i>Melas, Crathis.</i> { T. <i>Dyme, PATRÆ, Ægium.</i>	
	SICYONIA.	{ R. <i>Asopus.</i> { T. SICYON, <i>Pblus.</i>	
	CORINTHIA.	T. CORINTHUS, <i>Lechaum, Cenchræ.</i>	
	ARCADIA.	{ R. <i>Alpheus, Erymanthus, Aoranius.</i> { T. MEGALOPOLIS, <i>Mantina, Tegea, Orchomenus, Phigalia.</i>	
	TERRA FIRMA.	ATTICA.	T. ATHENÆ, <i>Eleufis, Marathon, Sunium, prom.</i>
		MEGARIS.	T. MEGARA, <i>Nyſæa.</i>
BÆOTIA.		{ R. <i>Cephiffus, Copais, lac. Asopus.</i> { T. THEBÆ, <i>Orchomenus, Ckeronæa, Tanagra, Eleu- tera, Theſpie.</i>	
PHOCIS.		{ R. <i>Cephiffus.</i> { T. DELPHI, <i>Elatia, Cryſſa, Anticyra.</i>	
DORIS.		T. <i>Cytinium.</i>	
LOCRIS.		{ Locri <i>Ozole, AMPHISSA, Naupaſus.</i> { Locri <i>Epicnemidii . . . CNEMIDES.</i> { Locri <i>Opuntii . . . OPUS.</i>	
ÆTOLIA.		{ R. <i>Achelœus, Evrenus.</i> { T. <i>Thermus, Calydon, Okakis.</i>	
ACARNANIA.		ARGOS <i>Amphilockicum, Stratus, Aſium.</i>	
GRÆCIA PROPRIA.		THESSALIA.	{ R. <i>Peneus, Oncheſtus, Sperchius.</i> { T. LARISSA, <i>Pharfalus, Pheræ, Demetriar.</i>
		EPIRUS.	{ R. <i>Acheron, Avas.</i> { T. <i>Buthrotum, Nicopolis.</i>
	ILLYRIA.	T. <i>Epidamnus, Apollonia.</i>	
	MACEDONIA.	{ R. <i>Erigon, Axius, Strymon, Haliacmon.</i> { T. EDESSA, <i>Pella, Theſſalonica, Olynthus.</i>	
ISLANDS..	To the Weſt.	<i>Corcyra, Leucadia, Cephallenia, Dulichium, Zaccynthus.</i>	
	To the South.	<i>Cybara . . . CRETA.</i>	
	To the Eaſt.	{ <i>Thera, Naxia, Paros, Delos, Myconus, Tinos, Andros, Ceos,</i> { <i>ELBÆA, Scyros, Thoſos.</i>	

The ancient authors who are to be consulted with regard to the different periods of the geography of Greece, are Homer, for the more remote times, in his account of the forces collected for the siege and capture of Troy; Strabo, who avails himself of ample materials to which he had access; Pausanias, who details the results of his own travels and observations; and Ptolemy, who furnishes an useful nomenclature of the states and chief towns, with their longitudes and latitudes.

GRÆCIA, or *Ancient Greece*, *history of*. The traditions of the Greeks (says the learned historian, Dr. Gillies,) agree with the authentic records of sacred history in representing the countries afterwards known by the names of Thrace, Macedonia, and Greece, as peopled at an earlier period than any other portion of the western world. The southern corner of Europe, comprehended between the 36th and 41st degrees of latitude, bordering upon Epirus and Macedonia towards the north, and on other sides furrounded by the sea, was inhabited, above 18 centuries before the Christian era, by many small tribes of hunters and shepherds, among whom the Pelasgi and the Hellenes were the most numerous and powerful. The barbarous Pelasgi venerated Inachus, as their founder; and, for a similar reason, the more humane Hellenes respected Deucalion. From his son Hellen, they derived their general appellation, which originally denoted a small tribe in Thessaly, and from Dorus, Eolus, and Ion, his more remote descendants, they were discriminated by the names of Dorians, Eolians, and Ionians. The Dorians took possession of that mountainous district of Greece, afterwards called Doris; the Ionians, whose name was gradually lost in the more illustrious appellation of Athenians, settled in the less barren parts of Attica; and the Eolians peopled Elis and Arcadia, the western and inland regions of the Peloponnesus. Notwithstanding many partial emigrations, these three original divisions of the Hellenes generally entertained an affection for the establishments which had been preferred by the wisdom or caprice of their respective ancestors; a circumstance which remarkably distinguished the Hellenic from the Pelasgic race. While the former discovered a degree of attachment to their native land, seldom found in barbarians, who live by hunting or pasturage, the latter, disdainful of fixed habitations, wandered in large bodys over Greece, or transported themselves into the neighbouring islands; and the most considerable portion of them gradually removing to the coasts of Italy and Thrace, those that remained melted away into the Doric and Ionic tribes. At the distance of 12 centuries, obscure traces of the Pelasgi occurred in several Grecian cities; a district of Thessaly always retained their name; and their colonies continued, in the fifth century B. C., to inhabit the southern coast of Italy, and the shores of the Hellespont; and in those widely separated countries, their ancient affinity was recognized in the uniformity of their rude dialect and barbarous manners, extremely dissimilar to the customs and language of their Grecian neighbours. Such is the account of the first settlers in Greece, given by Dr. Gillies on the cited authorities of Herodotus, Dionysius Halicarn., Pausanias, Thucydides, Diodorus Siculus, and Strabo. Modern authors, however, have entertained different opinions on this subject. Some have supposed that the Pelasgi succeeded the Hellenes, and others have considered them as the same people under different denominations. According to M. de Gebelin, Moses, the Jewish legislator, has given us the primitive origin of the Greeks. In tracing the genealogy of the descendants of Noah he says that Japhet, one of the sons of Noah, had seven sons: that the fourth was called Ion, and that he was the father of Elifa, Tharhis or Thra-

his, Ketim, and Dodanim; this Ion was the father of the Greeks, and M. de Gebelin labours to find among the Greeks four nations formed by his four sons. With this view, he says, that Pelasgia comprehended the whole territory between the Danube and the sea of Peloponnesus; and here we may discover, as he conceives, the respective situation of each of Ion's four sons. Thrace acknowledges Tharhis or Thrahis for its founder; Ketim possessed the country of the Getæ, N. of Macedonia, and Macedonia itself; Dodanim had the country that lay between Macedonia and the Peloponnesus, inhabited by the Dorians; and Elifa designated the inhabitants of the Peloponnesus. This author, in no small degree indulging his imagination, and yet exercising a very considerable degree of ingenuity and attention to facts, observes, that the history of Deucalion is the foundation of the Greek chronology and history: this Deucalion is distinguished by his deluge, his ark, and his being the father of the Greeks or Hellenes. All these circumstances afford a presumption that Deucalion and Noah were the same person. He also says, that the fable of the Argonauts and their voyage to Colehis is a copy of the navigation of Noah. Phryxus, or the "man saved," in the Grecian mythology, is Noah. He discovers also other coincidences, which lead him to conclude, not only that Noah and Deucalion, but that Ion and Hellen, the reputed father of the Greeks, were the same persons; and that the Hellenes and Pelasgi were the same people. According to this writer, the Pelasgi were the sole possessors of the whole country which extended itself from the banks of the Danube, to the sea of the Peloponnesus; they peopled Thrace, Getia, Macedonia, Illyria, Epirus, Thessaly, the Phocide, Attica, and the Peloponnesus; they sent colonies to the isle of Crete, to Etruria, and to the south of Italy; and others crossed the Danube, and were denominated Dacians and Getæ. Greece was in this state, says M. de Gebelin, when some colonies of strangers arrived on its coasts, as Cecrops at Athens, Danaus at Argos, and Cadmus in Bœotia. These, he says, came not from Egypt, but from Phœnicia, a neighbouring country. The first inhabitants of Greece, whence-soever they came, were, in a very considerable degree, like the ancestors of other people, barbarous and savage; and the Hellenes, whose manners were mild and gentle, contributed in some measure to civilize them; but their efforts produced effect very slowly. At length, however, the happy position of their country, forming a kind of frontier between Europe and Asia, and divided only by a narrow sea from Egypt and Syria, and not far remote from those eastern regions which were anciently most populous and flourishing, invited strangers first to visit, and afterwards to dwell among them. The Greeks were not insensible of their obligations to strangers for the most important discoveries, not only in religion, but in agriculture and the arts; but as they advanced to superiority in arts and arms, above surrounding nations, they vainly fancied that their infancy was reared by the gods; and to the gods they transferred the merit of many useful inventions, that had been communicated to them or their progenitors by their ancient visitants: and it must be acknowledged, that the worship of several divinities was introduced at the same time, and by the same persons, who made known to them the arts most subservient to the purposes of human life.

From the middle of the 16th to the middle of the 14th century, B. C. an inundation of Egyptians, Phœnicians, and Phrygians overflowed the Hellenic coasts. The principal colonies were conducted by Cecrops and Danaus, Egyptians, who respectively settled in Athens and Argos; Cadmus, a Phœnician, who founded Thebes in Bœotia; and Pe-



Tops, a Phrygian, whose descendants, by intermarriages with those of Danaus, king of Argos, and Tyndareus, king of Lacedæmon, or Sparta, acquired in the person of Agamemnon for powerful an ascendant in the Peloponnesus. The family of Deucalion still reigned in Thessaly; but Thebes, Athens, Argos, and Sparta, which were long regarded as the principal cities of Greece, thus fell under the dominion of four foreign lines of princes, whose exploits, and glory, and misfortunes are immortalized by the first and noblest productions of Grecian genius; such are the works of Homer and Pindar, and of the Greek tragedians.

The invaders of Greece introduced many important and useful improvements. They brought into that country the knowledge of the Phœnician alphabet; they assisted them in the operations of agriculture; they multiplied the rites of religion; discovered to them several uses of the metals; and, in return, adopted the Grecian language, and generally conformed to the Grecian customs and institutions. By the Phœnicians they were taught and encouraged to brave the dangers of the sea, and to maintain a commercial intercourse with each other, as well as with foreign nations. Their country, indeed, was peculiarly advantageous for this purpose; three sides of it being washed by the sea, and being surrounded by numerous islands, and abounding in excellent harbours. Greece, however, was slow in availing itself of the advantages it enjoyed; and in making improvements in commerce, as well as in agriculture, and other useful arts. Many circumstances concurred to retard its improvement. The inhabitants of different parts of the country were unconnected on account of the creeks and rivers, as well as the mountains and promontories, that rendered Greece different from any other part of Europe. The Grecian states were small; each city was at war with its neighbour, and want of union and mutual concurrence prevented their advancement in science and the arts. Besides, their coasts were ravaged by pirates, and the metals, instead of being formed into useful implements of agriculture, were converted into instruments of destruction, partly for hostility and partly for self-defence; and the inland country was invaded by Thracians, Amazons, and other northern savages. But these irruptions and ravages of the barbarians occasioned the institution of the Amphictyonic council, which restored some degree of present tranquillity to Greece, and laid the foundation of its future grandeur. This council produced, after a considerable interval of time, *viz.* in the year 1263 B. C. the Argonautic expedition, an undertaking which was attended with a beneficial effect on the manners and character of the Greeks. (See ARGONAUTIC.) In the progress of the Greeks towards civilization, they perceived the advantages of political confederacy, before they became sensible of the benefits of civil union; and accordingly a federal association between different communities was formed before the members of any one state had been sufficiently united in the system of domestic policy. In order to cement such disorderly communities by laws and governments, they had recourse to the wise institutions and examples of the Cretans, which are represented not only as the most ancient, but as the best regulations that ever were established in any portion of the Grecian territory. (See CRETÆ.) Theseus communicated the Cretan improvements to the Athenians; from Athens they were diffused through Attica, and in process of time through the neighbouring provinces of Greece; inasmuch, that at the commencement of the Trojan war, in 1193 B. C. all the Grecian states had adopted one uniform system of government, uniting the independent spirit of European freedom with the respectful veneration of Egyptian and Asiatic superstition.

Of the mythology and manners of the Greeks in the heroic ages, as well as their geography and history, Homer, whilst he has indulged his fancy, has given us an accurate delineation; and such as was conformable to the system of opinions and belief which prevailed among his countrymen. The religion, or mythology of the Greeks, was adapted to the melioration of their condition, and to the improvement of civil society. Unlike that of the rude inhabitants of ancient Germany, among whom the offices of priest and king were administered by different persons, the sceptre, which denoted the collection of civil power with sacred protection, was conferred, among the Greeks, on those who, while they continued the humble ministers of the gods, were appointed to be the chief, but accountable guardians of the people. The same voice (says Dr. Gillies), that summoned the warriors to arms, or that decided, in time of peace, their domestic connections, conducted the order of their religious worship, and presided in the prayers and hymns addressed to the divinity. These prayers and hymns, together with the important rite of sacrifice (which was likewise performed by royal hands), formed the *ceremonial* part of the Grecian religion. The *moral* was far more extensive, including the principal offices of life, and the noblest virtues of the mind. The useful quality of courage was peculiarly acceptable to the stern god of war; but the virtues of charity and hospitality were still more pleasing to the more amiable divinities. To this purpose Homer says (Od. xiv. 57.) "all strangers and beggars come from Jove." The submission of subjects to their prince, the duty of a prince to preserve inviolate the rights of his subjects (Il. xvi. 385.), the obedience of children to their parents, the respect of the young for the aged, the sacred laws of truth, justice, honour, and decency, were inculcated and maintained by the awful authority of religion. Even the most ordinary transactions of private life were consecrated by the piety of the Greeks. They ventured not to undertake a voyage, or a journey, without soliciting the propitious aid of their heavenly protectors. Every meal (and they had three in a day, *viz.* *agros, kotinos, karyon*), was accompanied with a sacrifice and libation. The common forms of politeness, the customary duties of civility, were not decided by the varying tastes of individuals, but defined by the precise voice of the gods. The laws of religion were guarded and enforced by corresponding factions. The dreaded vengeance of imaginary powers was still lished in the Grecian creed; and it appears from the writings of Homer throughout, that every important event, prosperous or adverse, which happened either to individuals or to nations, appeared to the Greeks, as the reward of their religion and virtue, or the punishment of their irreligion and vice. The principles above stated are confirmed not only by the writings of Homer and Hesiod, but by almost every page of Herodotus, of Pindar, as well as of the Greek tragedians and historians.

The origin of the gods of Greece has afforded a subject of elaborate discussion; and many learned writers have traced it to Palestine, Egypt, and other nations, whence the first settlers or future emigrants sprung. By the dim light of etymology and tradition (says the ingenious historian of Greece), and the deceitful glare of legend and fable, inquisitive men have endeavoured to trace the corrupted streams of Pagan worship to the pure fountain of the Jewish dispensation; and it must be acknowledged, that the general doctrine of providence, the rebellion in heaven, the state of innocence, the fall of man, atonement by sacrifice, and a future state of retribution, for which the present life is only preparatory, are tenets, all, or some of which, are found in

the traditions of all nations, Greeks and Barbarians. (See Hesiod, Oper. and Di. v. 110, 165. Theog. v. 220. 725.) But our author observes, that the majesty of Jehovah is very feebly represented by the united power of Homer's divinities; and that the mythology of the Greeks is of such a peculiar texture, that, whencesoever originally derived, it must have undergone a particular modification in the Grecian soil; nor (he says) is it easy to concur with the opinion of writers who bring it immediately from Egypt, Chaldæa, or Lesser Asia, when we consider that there is not the smallest vestige in Homer of the judicial astrology which prevailed so much in the two first countries, (Diod. Sic. l. ii. Exod. ch. vi. Plin. l. xxv), or of the worshipping of idols, which almost universally prevailed in the last. (Old Testament, passim.) Dr. Gillies traces the origin of the Grecian faith and worship in the natural passions of the human heart, the hopes, the fears, the wants, the misery of man, which have in all ages rendered him a prey to the terrors of superstition.

The great pillar of superstition, raised by the anxious passions of men, was fortified in Greece by a peculiar sensibility of character, which exerts itself in the ardour of social affection, and strengthens, by a thousand associations, their belief of invisible and intelligent powers. The nature, the characters, and the occupations of the gods, were suggested by the lively feelings of an ardent, rather than by the regular invention of a cultivated mind. These celestial beings were subject to the blind passions which govern unhappy mortals: their wants, and their desires, were similar to those of man. But what was wanting in the dignity and perfection, was supplied by the number of the gods. Homer only describes the principal and reigning divinities; but Hesiod, who gives the genealogical history of this fanciful hierarchy, makes the whole number amount to 30,000. Every virtue had its protector, every quality of extensive power in human life had its patron, and every grove, mountain, and river its favourite inhabitants. (See Gods.) The religious creed of the Greeks, composed of materials, in great measure created by fancy, formed by poetry into beauty, and improved into use by policy, became the happiest antidote against the furious resentment, the savage cruelty, and the fierce spirit of wild independence, which usually characterizes the manners of barbarians. Upon the whole, the ancient and venerable superstition of the Greeks was distinguished above most other false religions, by the uncommon merit of doing much good, without seemingly occasioning any considerable harm to society. The Grecian tenets, while they inculcated profound respect to the gods, had no tendency to break the spirit or to repress the courage of their warlike votaries. In order to avert the calamities threatened by the anger of their divinities, they did not recur to the infliction of tortures on themselves, but they repaired the wrongs which they had committed against their fellow-citizens, or compensated, by new attentions, for the neglect shewn to the ceremonies of their national worship. In their estimation, the doing of injury to men, and the omission of prayer to the gods, were the principal causes of the divine displeasure, which they were anxious to avert by a diligent practice of moral duties. The dangerous power of oracles, the abused privileges of asylums, the wild raptures of prophetic enthusiasm, the abominable ceremonies of the Bacchanalia, and the horrid practice of human sacrifices, all which are circumstances that cover with deserved infamy the latter periods of Paganism, were unknown to the good sense and purity of the heroic ages; nor is there to be discovered the smallest vestige of any of these wild or wicked inventions, either in the writings of Homer, or of his cotemporary Hesiod. Their religious sys-

tem communicated its beneficial influence to the civil and military institutions of the Greeks, to the laws of nations, as well as to the regulations of internal policy, and to the various duties of domestic as well as of social life.

In examining the political states of the Greeks, during the heroic age, we shall find that they deserve the title of republics, rather than that of monarchies. The soldiers of any warlike tribe fought and conquered, in their attack of a more fertile territory than their own woods and mountains, not for their leaders, but for themselves: and the land acquired by their united valour was considered as a common property. No distinction was known among them, but that which was occasioned by the difference of personal merit and abilities. This difference raised a chief or leader to the head of each society; and his superior usefulness in this station, was rewarded by the gratitude of his tribe with a valuable portion of ground, separated from the common property. (Il. xii. 310.) This person, who commanded in the field, became the arbiter and judge of their civil differences, and he was invested with the honourable office of presiding in their religious solemnities. These important functions of priest, judge, and general, conferred on the best and bravest in each particular tribe, were conferred, upon the union of several tribes into one state or nation, on the best and bravest of all the different leaders. The various states of Greece formed a general confederacy, in which the council of princes regulated the resolutions of the monarch, and the voice of the assembly ruled that of the council; and so likewise in each particular kingdom, the decisions of the senate prevailed over the will of the prince, and the acknowledged majesty of the people controuled the decisions of the senate. The same distribution of power took place in every particular village.

The civil rights of the Greeks were maintained by the same simplicity which regulated the political system. As the price of submitting to the restraints of society, a man was secured in the enjoyment of his life and property: his moveables were equally divided, at his death, among his descendants; and the unnatural right of primogeniture, which, in order to enrich the eldest son, reduces the rest of the family to want and misery, was altogether unknown to the equal spirit of the Grecian institutions. Causes respecting property were decided by the first magistrate, or by judges of delegated authority. The prosecution of murderers belonged to the relations of the deceased, who might accept a compensation in money for the loss which the family had sustained; but in defect of this composition, all the members of the tribe concurred with the aggrieved, in either punishing the murderer by death, or compelling him to leave the society.

The history of the heroic ages of Greece presents the most interesting picture of conjugal love, parental affection, and filial duty. The institution of marriage was ascribed to the gods; and it was celebrated with all the pomp of religious festivity. Adultery was held in the greatest detestation, and always mentioned with the same horror as murder. The guilty person might purchase immunity, but more frequently escaped death by voluntary banishment. It has been erroneously said, that, in ancient Greece, wives, as well as concubines, were the slaves of their husbands, and that they were purchased by them. The attention of women was chiefly confined to domestic care and occupations, which did not require any great degree of strength, courage, or wisdom. Weaving and embroidery, which were employments of females, were practised by ladies of the highest rank, and even by queens; and they were also entrusted

arrived, and the education of their children. They were not content to join in the celebration of religious rites and ceremonies, and many of them were consecrated to the service of particular divinities.

War, being the principal employment of the Greeks in the heroic ages, they supplied by courage what they wanted in skill. They marched to the field in a deep phalanx, rushed impetuously to the attack, and bravely closed with their enemies. Their principal weapon was the spear; and when the use of this failed, they drew their swords, and rushed impetuously on the foe. The Greeks had also bows, slings, and darts; which were chiefly used in their military pallises. Their defensive armour was complete: a light helmet, adorned with plumes, covered the head and face, a fine corslet defended the breast, greaves of brass defended to the feet, and an ample shield, loosely attached to the shoulders, turned in all directions, and opposed its firm resistance to every hostile assault. Their close compact combats served to excite the most furious passions, and to embitter national animosity by personal hatred and revenge. Before any war could be undertaken, it was necessary to dispatch ambassadors, who explained the injury that had been done, demanded satisfaction, and if this were refused, denounced the resolution of their community to prosecute its claim by force of arms. After the commencement of war, the characters of heralds were equally respected by friends and foes; and they travelled in safety through the midst of embattled hosts. The use of poisoned weapons was forbidden, under pain of the divine displeasure. The will of the gods required that life should be spared, when a sufficient ransom was promised; and when a treaty of peace was concluded, without any ratification but the honour of the contracting parties, the perfidious wretches who betrayed the sanctity of their engagements were devoted, amidst libations and sacrifices, to the fury of the terrible goddesses. (*Iliad*, iii.)

From the practice of war we may now turn our attention to the arts of peace. Pasturage and agriculture supplied the Greeks with food and clothing; but their implements for preparing these articles were very imperfect. The principal produce of their fields was barley, which supplied the ordinary food of men as well as horses. Mills were unknown, and the grain was bruised between two large stones with the hand. They cultivated the olive, but knew not how to extract the oil; and though their soil was favourable to the grape, the juice was obtained by a tedious and operose process, which rendered wine scarce and dear. Of the mechanic arts, weaving was best understood; and the hatchet, wimble, plane, and level, are the tools mentioned by Homer, who seems to have been unacquainted with the saw, the square, and the compass. Homer does not mention the orders of architecture; and pillars are the only ornaments assigned to the edifices which he describes. The roofs of the houses, consisting of two floors, and surrounded by a wall, were flat. The invention of enamelled metals had been cultivated with peculiar success; and though painting, properly so called, was rude and unformed during the age of Homer, the genius of the divine poet has described the rudiments of his kindred art with such graces as would adorn its most refined state of perfection. Music was much practised among the early Greeks. (See *Music of the GREEKS*.) The sciences were in a low and imperfect state. For arithmetic they had little occasion; by means of their astronomy they were enabled to observe the constellations which directed the adventurous course of the mariner; but their navigation was so imperfect, that they seldom abandoned the coasts. The only stars mentioned by Homer are the

Great and Little Bear, the Pleiades, the Hyades, Orion, and the Dog-star. Of their games, we give an account under GAMES and GYMNASTICS. As to their general character, we shall transcribe two or three paragraphs from the first volume of Dr. Gillies's History of Ancient Greece, to which we have been indebted in the compilation of this article. "The Greeks," says Dr. G., "had advanced beyond that uniform insipidity of deportment, that fullness of manners, and that hardened insensibility of heart, which universally characterizes the savage state. They still possessed, however, that patient intrepidity, that noble spirit of independence, that ardent attachment to their friends, and that generous contempt of pain, danger, and death, which render the description of the wild tribes of America so interesting to a philosophic mind. Of two principal enjoyments of life, study and conversation, they were little acquainted, indeed, with the consolation and pleasures of the first, the want of which was compensated by the facility, the confidence, the charms of the second. Their social affections were less comprehensive in their objects, but more powerful in their effects than those of polished nations. A generous chief rushes to certain death to revenge the cause of his friend; yet refuses to the prayers of an aged parent the melancholy consolation of interring the remains of his favourite son, till the corresponding image of his own father strikes his mind, and at once melts him to pity. (*Iliad*, xxiv.) The imaginary wants and artificial passions which are so necessary to urge the hand of industry, and to vary the pursuits of men, in improved commercial societies, were supplied to the Greeks by that excessive sensibility, which interested them so deeply in the affairs of their community, their tribe, their family, and their friends, and which connected them by the feelings of gratitude even with the inanimate objects of nature. As they were not acquainted with the same diversity of employments, so neither were they fatigued with the same giddy round of dissipated pleasures which augment the splendid misery of later times. Though ignorant of innumerable arts which adorn the present age, they had discovered one of inestimable value, to render the great duties of life its most entertaining amusement. It will not, perhaps, be easy to point out a nation who united a more complete subordination to established authority with a higher sense of personal independence, and a more respectful regard to the dictates of religion with a more ardent spirit of martial enterprise. The generous quality of their political establishments, and their fancied intercourse with the gods, conspired to raise them to a certain elevation of character which will be for ever remembered and admired. This character was rendered permanent in Sparta, by the famous laws commonly ascribed to the invention of Lycurgus, but which will appear (under that article) to have been almost exact copies of the customs and institutions that universally prevailed in Greece during the heroic ages." The character of the Greeks in subsequent periods will appear in the account of the several states, provinces, or kingdoms, which they occupied.

The general history of Greece may be divided into four periods, marked by as many memorable epochs. The *first* extends to the siege of Troy in the year 1184 B.C.; the era of its commencement is not precisely ascertained; but it we date it with the foundation of the kingdom of Sicily by Argilæus in the year 2087 B.C., it lasted 105 years. This was properly the infancy of Greece; and comprehend the establishment of the kingdom of Sicily, of Argos, 1554 B.C., of Athens, 1556 B.C., of Troy, 1546 B.C., of Thebes, 1493 B.C., of Mycenæ, 1344 B.C.; the deluge of Ogyges, 1764 B.C. and that of Deucalion, 1503 B.C.;

the murder committed by the daughters of Danaus on their husbands, 1485 B.C.; the introduction of the Phœnician letters into Greece, 1493 B.C.; the legislation of Minos in Crete, 1406 B.C.; the Argonautic expedition, 1263 B.C.; the exploits of Theseus, 1234 B.C.; the war of the seven heroes against Thebes, 1225 B.C., &c. &c.

The *second* period begins with the siege of Troy, and terminates with the battle of Marathon, 490 B.C., including about 694 years. In the year 1104 B.C., 80 years after the taking of Troy, the Heraclidæ, or descendants of Hercules, conducted the Dorians to the eastern coast of Peloponnesus, and having landed their followers without opposition, assailed the defenceless territories, to which they had long laid claim, comprehending the whole peninsula, except the central province of Arcadia, and the maritime district of Achaia. The five other provinces were conquered at the same time, though by different means. Laconia was betrayed to the invaders; Argos acknowledged their authority; Corinth, Elis, and Messenia submitted to their arms. The revolution was complete, and effected with little bloodshed; but not without great oppression of the ancient inhabitants, many of whom emigrated, and many were reduced to slavery. The Heraclidæ divided their new acquisitions by lot. Upon the division of Peloponnesus the kingdom of Lacedæmon commenced, 1102 B.C. In the year 1096 B.C., or 88 years after the taking of Troy, the Eolians, having traversed the northern parts of Græcia in quest of new settlements, crossed the Hellespont, and established themselves along the shore of the ancient kingdom of Priam. They gradually diffused their colonies from Cyzicus on the Propontis to the mouth of the river Hermaus; which delightful country, together with the isle of Lesbos, from this time received the name of Eolis or Eolia, denoting that its inhabitants belonged to the Eolian branch of the Hellenic race. In the year 1070 B.C. royalty terminated in Athens upon the death of Codrus, and the Athenians were afterwards governed by Archons. In the year 1044 B.C., 60 years after the return of the Heraclidæ, the Ionians, blended with other emigrants, having seized the central and most beautiful part of the Asiatic coast, gradually diffused their colonies from the banks of the Hermaus to the promontory of Posidion, and afterwards took possession of Chios and Samos; and all these countries were united in the year above-mentioned by the name of Ionia, intimating that the Ionians composed the most numerous division of the colony. (See IONIA) The Doric migration took place in the year B.C. 944 (See DORIS)

During the heroic ages we have seen, in the preceding part of this article, that the authority of kings was founded on religion, supported by gratitude, and confirmed by utility. While they approved themselves worthy ministers of heaven, they were entitled to due and hereditary honours; but they were bound to respect the rights, the sentiments, and even the prejudices of their subjects. But at length, incited by ambition and avarice, they transgressed the prescribed limits, and trampled on those laws which their predecessors had held sacred. The minute division of property, which had taken place, not only in Peloponnesus, but in the northern provinces of Greece, rendered the nobles and people more sensible of their encroachments, and induced them to resist their oppressor. The more independent and illaltrious citizens, who from the earliest times had been accustomed to come armed to the council or assembly, communicated their grievances, and adopted proper means for removing them. Minas, the fourth Argive prince in succession to Temenus, to whom Argos fell on the Heraclidan distribution, was con-

demned to death for usurping absolute power. In Attica monarchy more honourably expired; it perished still more disgracefully in Arcadia; but was gradually abolished in every province of Greece, except Sparta, from the southern extremity of Peloponnesus to the northern frontier of Thesaly. The consequence of the abolition of monarchy was the introduction of accumulated evils. These, however, were removed, or at least alleviated, by the authority of the Amphictyonic council, and by that of the oracles, particularly that of Delphi. This latter oracle confirmed by its awful sanction the Olympic games and Spartan laws, which had been respectively established, the former by Iphitus, and the latter by Lycurgus in the same year, *viz.* 884 B.C.; and which served to the safety of their respective territories, though in different ways; the Olympic games by rendering Elis the most pacific, and the laws of Lycurgus by making Sparta the most warlike, of all the Grecian communities. Greece, even under its kings, was divided into many independent states; and under the republican form of government it was still more subdivided; and hence wars became more frequent, and battles more bloody and more obstinate. But the long and spirited contest between the Lacedæmonians and Messenians was the only war of that age which produced permanent effects. Of Laconia and Messenia we shall give an account under their respective articles. We shall here observe, that they were both governed by kings of the family of Hercules, and inhabited by subjects of the Doric race, and yet this kind of mutual affinity and connection was not sufficient to counteract other causes, which produced hostilities among them. Urged by reciprocal provocations which we cannot here detail, the Spartans invade the Messenian frontier and attack the small town of Amphica; and thus in the year 743 B.C. began the first war between the Messenians and Lacedæmonians, which lasted 19 years, and terminated with the surrender of Ithome, their capital, to the Lacedæmonians, and the dispersion of its inhabitants. In the year 685 B.C. the Messenians prepare to revolt, and a second war commences, which continued 14 years, and ended with the capture of Ira, or Eira, by the Lacedæmonians, after a siege of 11 years. The conquest of Messenia rendered Sparta the most considerable power in Greece, as its subjects occupied two-fifths of the Peloponnesus. In the year B.C. 600 commenced the first "Sacred War," occasioned by an injury committed against the oracle of Delphi, and undertaken by order of the Amphictyons, and terminated by the total destruction of the cities accused of sacrilegious outrage. On occasion of the happy termination of this war the Pythian games were re-established 591 B.C. The battle of Marathon, which closes this second period of the Grecian history, terminated, after a very severe contest, in the total defeat of the Persians, and triumph of the Athenians under their commander Miltiades.

The *third* period of the history of Greece comprehends an interval of 167 years, that elapsed between the battle of Marathon and the death of Alexander, 323 B.C. The Athenians, in compliance with the advice of Themistocles, augment their navy; and under his command they defeat the fleets of Ægina and Coreyra. Themistocles, instead of allowing the Athenians to indulge themselves in security after the advantages they had gained, exhorted them to be always ready for action. In consequence of this judicious council, they were enabled to oppose the immense armaments of Xerxes. The Athenian fleet proved the safe-guard of Greece, and prevented a country, from which the knowledge of laws, learning, and civility was destined to flow over Europe, from becoming a province of the Persian empire, and being confounded with the mass of barbarous nations. Xerxes was

provided with 1200 ships of war, and 3000 ships of burthen, for his intended expedition: and his army consisted of seventeen hundred thousand infantry, and four hundred thousand cavalry, and these, joined to those who manned his fleet, amounted to near two millions of fighting men. In the year 480 B.C. he passed the Hellespont, and the vain-glorious monarch had the pleasure of reviewing the whole fleet and army near Doriscus, a city of Thrace, at the mouth of the river Hebrus. In the mean while those Grecians, who, unmoved by the terrors of invasion, obeyed the voice of liberty and their country, had sent deputies to the isthmus of Corinth, to deliberate about the common safety. A general union prevailed, and the general danger seemed to harmonize the most discordant members of the common council. The Grecian fleet sailed to Artemisium, patiently expecting the arrival of the barbarians. The straits of Thermopylæ, 15 miles distant from the station of the Grecian fleet at Artemisium, and deemed the gate or entrance into Greece, was guarded by troops, consisting chiefly of Peloponnesians, under the command of Leonidas, the Spartan king. Xerxes having made his previous arrangements, sent messengers to treat with the Spartans, and to desire them to lay down their arms; to which they replied, "Let him come and take them." The messengers then offered them lands, on condition of their becoming allies to the great king, but they answered: "That it was the custom of their republic to conquer lands by valour, not to acquire them by treachery." Xerxes waited four days after the return of the messengers, expecting the Grecians to retreat into their own country, or surrender their arms. On the fifth day he determined to chastise their insolent opposition. The attack was ordered, and the Persians were repelled: it was renewed the next day with the like result.

The Greeks, however, were betrayed by Epialtes, a perfidious wretch of their own nation, who conducted a body of twenty thousand Persians through a passage in the mountains of Oeta, several miles to the west of that guarded by Leonidas. The Athenian general had prudently guarded this important but unknown pass, which, as he conceived, chance or treachery might discover to the Persians. A body of 1000 Phocians had been appointed to this service; upon the approach of the Persians they instantly flew to their arms, and determined to resist the progress of the enemy or to die in the attempt. Expecting to be pursued, they retired to the highest part of the mountain; but the Persians, declining to follow them, seized the passage which they had abandoned, and marched down the mountain in order to accomplish the design which had been preconcerted by the traitor Epialtes. Leonidas, apprized of this act of treachery, called a council of war; when all the confederates of Peloponnesus, except the Spartans, determined to abandon a post which they deemed to be untenable. Leonidas, however, with 700 Thebians, 400 Thebans, and 300 Spartans, remained in the post of danger and of glory. In the dead of night the Spartans, headed by Leonidas, marched in a close battalions towards the Persian camp, with resentment heightened by despair. The conflict was ardent and destructive, whilst the Greeks were favoured in their attack by the darkness of the night; but at the approach of day the Persians, who had previously fled, discovered that their fears had multiplied the number of the enemy; and therefore rallying their scattered forces, Xerxes gave orders to pursue the Greeks, who had retreated in close order to the straits of Thermopylæ. The shock was dreadful; and the battle was maintained on the side of the Greeks with persevering intrepidity and desperate valour. At length a barbarian dart pierced the heart of Leonidas; nevertheless the Lacedæmonians and Thebians,

though ingloriously deserted by the Thebans, maintained their firmness to the last; and they were finally not destroyed or conquered, but buried under a trophy of Persian arms. (See LEONIDAS and THERMOPYLÆ.) During their illustrious operations at Thermopylæ, the Grecian fleet was stationed in the harbour of Artemisium, the northern promontory of Eubœa, and the numerous one of the Persians had anchored on the road that extends between the city of Chama and the promontory of Sepia, on the coast of Thessaly. Here it suffered calamities, of which Xerxes had been forewarned, but which he disregarded. Themistocles, by his address, prevailed on the Athenian commander to remain at Artemisium; and as soon as the Persians recovered from the terrors of the storm, the effects of which they had suffered, both sides prepared for a battle, for the result of which see ARTEMISIUM. The Persians were again totally defeated near Salamis (which see); upon which Xerxes determined to leave Greece. Of the conduct of Themistocles on this occasion, see his article; and for an account of the battle of Platea, see PLATEA. The event of this bloody engagement not only delivered the Greeks from the danger of servitude, but gave them possession of greater wealth than they could ever have expected to possess. In his precipitate retreat from Greece, Xerxes left behind him all his riches and magnificence. The battle of Platea was succeeded by that of Mycæ, in which the Greeks were again victorious. About 40,000 Persians perished in the field, many fell in the pursuit, and the remainder fled in disorder, nor thought themselves secure till they had reached the walls of Sardis. Their ships, their camp, the freedom of Ionia, and the undisturbed possession of the Asiatic coast, formed the inestimable prize of the victors; and thus the expedition of Xerxes, undertaken with a view to enslave Europe, restored liberty to the fairest portion of Asia. The beginning of the 5th century B.C. forms the most glorious era in the history of Greece. It is, however, the peculiar glory of the Athenians that, during their rapid career of military and naval triumphs, they cultivated, with a generous enthusiasm, the arts which adorn peace as well as war. It is observable that in the single life-time of Pericles, the republic of Athens produced those inestimable models of poetry, eloquence, and philosophy, which, in every succeeding age, the admiration and imitation of mankind hath invariably regarded as the highest standards, not merely of competition and emulation, but of taste and reason. The name of Greek is and thenceforth to be sunk in that of Athenian. (See ATHENS, and SPARTA.) For an abstract of the farther history of this period of Alexander's history and empire, we have given a brief sketch under his article: we shall here observe, with Dr. Gillies, that during the latter years of his reign the Greeks, deprived of the honour and deliverance of their own care of independent sovereignty, and undisturbed by their continual and often bloody dissensions, which deform the annals of their tumultuous liberty, indulged their natural propensity to the social embellishments of life; a propensity by which they were honourably distinguished above all other nations of antiquity. Their innumerable shows, festivals, and dramatic entertainments, were exhibited with more pomp than at any former period. The schools of philosophy and rhetoricians were frequented by all descriptions of men. Painting and statuary were cultivated with equal ardour and success. Many improvements were made in the sciences, and the Greeks, particularly the Athenians, all rivalled the taste and genius, though not the spirit and virtue, of their ancestors. Yet even in this degenerate state, when patriotism and true valour were extinct, and these vanquished republicans had neither liberties to love, nor country to defend, they

martial honours were revived, and brightened by an association with the renown of their conqueror. Under Alexander, their exploits, though directed to very different purposes, equalled, perhaps excelled, the boasted trophies of Marathon and Platea. By a singularity peculiar to their fortune, the era of their political disgrace coincides with the most splendid period of their military glory. Alexander was himself a Greek; his kingdom had been founded by a Grecian colony; and to revenge the wrongs of his nation, he undertook and accomplished the most extraordinary enterprises recorded in the history of the world.

The fourth period of the history of Greece, commencing with the death of Alexander, 323 B.C. and terminating 146 B.C. when the Achaean league was dissolved, and Greece became a Roman province, under the name of Achaia, comprehends an interval of 177 years. After various changes and revolutions, for an account of which, see ACHAENS and ACHIENS, it became subject to the Turks.

GRÆCIA, *Magna*, a name given to the southern part of Italy, comprehending Apulia, Lucania, and the country of the Brutii, and also to Sicily and several of the adjacent islands. The name of *Græcia* was derived from the Greek colonies, which migrated hither at different periods, and the epithet *magna*, or great, was derived from mere ostentation, as Pliny informs us (l. iii. c. 5.). This migration and settlement took place at a very early period, about 1055 years B.C. The most numerous colonies, the migration of which was occasioned by intestine faction, foreign invasion, or the restless spirit of adventure and rapine, occupied the isles of the Ionian and Ægean seas, the southern coast of Italy almost intersected by the former, and the winding shores of Asia Minor so beautifully diversified by the latter. The larger islands of Sicily, Sardinia, and Cyprus were very anciently planted by Greeks.

Whoever has observed the desolate barbarity of Calabria, or reflected on the narrow extent and present weakness of Sicily, will scarcely believe, that five centuries B. C. those countries contained above 20 warlike communities, several of whom could send into the field 100 thousand fighting men. In order to account for this wonderful population, we must look back to the period above mentioned in the heroic ages; and consider likewise that the greater number of Greek colonies in those parts were planted during the eighth century before the Christian era, and chiefly, 1. By the Eubœans, whose principal city Chalcis, usually furnishing the conductor of the colony, gave the epithet of Chalcidian to the new settlements; 2. By the Achæans of Peloponnesus, who were of the Eolian tongue and lineage; and 3. By the Dorian states of that peninsula, especially Corinth. Besides their powerful colonies in Coreyra, Lencas, Anactorium, Ambracia, whose transactions form such an important part of the history of ancient Greece, the Corinthians founded Syracuse, which soon became, and long continued, the capital of Sicily; and in the sixth century B. C. the Syracusans had extended their settlements over all the southern coast of the island. By means of these and similar establishments of a powerful kind, the Dorians acquired, and always maintained, an ascendant in Sicily; but the Achæan colonies, who were of the Æolian blood and language, commanded the Italian shore. Crotona, the most considerable city of the Achæans, and of all Italy in ancient times, was built 710 years B. C. Sybaris, its rival, was founded about the same time. The former sent colonies to Tirina, Cephalonia, and Pandosia; the latter built Laus, Metapontum, and Posidonia, or Posstum, whose admired ruins attest the ancient wealth and grandeur of the Greek cities of Italy. We may here remark, that the Ionians,

who came from Eubœa, and settled chiefly near the eastern shore of Sicily, never rivalled the power and fame of their Dorian and Æolian neighbours, but fell short of those nations in Magna Græcia, as much as they surpassed them on the shores and islands of Asia. In order to account for the flourishing situation of Magna Græcia about the year 500 B. C., many causes may be assigned, besides those of a physical and moral nature, which usually contribute to the rapid growth of newly-established colonies. We might mention the natural fertility of Magna Græcia, and particularly of Sicily, which in many places produced an hundred fold; and in this connection observe, that the Greeks who sailed thither from Peloponnesus, carried with them the knowledge and practice of agriculture, which had early attained a high degree of perfection in their peninsula; and that the exuberant soil of Sicily, improved by cultivation, soon exhibited a picture of that rich abundance, which, in later times, made that beautiful island be entitled the granary of Rome. Besides, the peculiar situation of the Achæans and Dorians, from whom chiefly the colonies in Magna Græcia derived their origin, had a considerable influence in accelerating the population and grandeur of these new establishments. The impartial and generous spirit of the Achæan laws early compensated the natural defects of their territory, which was a long, but narrow, strip of ground, not more fertile than extensive, along the Corinthian gulf. They, however, were the first, and long the only republic of Greece, who admitted strangers into their community on equal terms with the ancient citizens. The equitable and generous policy, which they transported with them into Magna Græcia, could not fail to promote the happiness and prosperity of that delightful country. The condition of the Dorians, at the time when they planted colonies in Italy and Sicily, is not less worthy of consideration. The Dorian states of Peloponnesus were then universally subject to the gentle government of limited but hereditary princes, or to magistrates chosen from the descendants of their ancient royal families; and who, thus adorned by birth, were sometimes still more ennobled by wisdom and virtue. Moreover, the colonies in Magna Græcia, enjoying a wide extent of territory before them, were not retarded in their advancement by interference of interest on the part of neighbouring states, but they found sufficient employment in subduing the original inhabitants of that country, without commencing hostilities either against their neighbours or against each other. The kings or nobility of Magna Græcia, secure of their own pre-eminence, felt nothing of the republican jealousies which prevailed in the mother country. They received with pleasure new citizens, or rather subjects, from whatever quarter they might come. The states of Italy and Sicily, thus increasing by degrees, could soon boast, the former of Crotona, Tarentum, Sybaris, Rhegium; the latter of Syracuse, Agrigento, Messenè, Himera, and several other cities, which rivalled or surpassed the wealth of Athens or Corinth, and the populousness of Thebes, Argos, or Sparta. The wars, conquests, or oppressions, and, above all, the civil dissensions, which in the sixth century B. C. disturbed and deformed the coast of Ionia, and the other Grecian colonies in the islands and continent of Asia, brought frequent accessions of inhabitants to the shores of Magna Græcia. Nevertheless, the Ionians, along with their poetry, music, and painting, communicated also their dissolute and artificial appetites to the Greeks of Italy and Sicily. It is a fact, however, that Magna Græcia, having obtained opulence by industry, dissipated it in idleness and licentiousness: inasmuch that the Greek cities of Italy, and particularly Sybaris and Crotona,



fall a prey to the most dangerous errors and vices, when Pythagoras came to their relief about 550 years before the Christian era. His philosophy and legislation reformed and improved the manners and policy of Magna Græcia, and contributed, in an eminent degree, not only to the quiet and happiness, but to the industry, power, and splendour of that celebrated country. (See PYTHAGORAS.) The concurring testimony of historians assures us, that the school of Pythagoras flourished above 40 years to the unspeakable benefit of Magna Græcia when a war arose between Crotona and Sybaris, the latter of which had ever contemptuously rejected the Pythagorean institutions.

Having traced the progress towards prosperity and renown of Magna Græcia, it is natural to state the causes of its decay. In Italy, the citizens of Crotona had too soon reason for lamenting their insurrection against their magistrates, and their dereliction of the discipline of Pythagoras. The other Greek cities of Italy, which are said to have imitated the fatal example of Crotona, were harassed by wars against each other, or against their barbarous neighbours. In 60 years after the death of Pythagoras, an attempt was made to revive his institutions; but in less than 40 years a new persecution entirely drove the Pythagoreans from Italy, and completed, according to Polybius (i. 403.) the confusion and misery of that once happy country. Gillies's Hist. of Greece, vol. ii.

GRÆCINUS, JULIUS, in *Biography*, a Roman senator, who flourished in the reign of Caligula, was son of a Roman knight, and greatly distinguished for eloquence, and for the study of philosophy, and he carried into practice the moral lessons which his studies led him to contemplate. He refused to obey the command of the emperor to appear as the accuser of Marcus Silanus, and suffered death in consequence. Seneca says of him, that he was put to death for the sole reason, that he was too good a man to be permitted to live under a tyrant. He is mentioned by Columella, as having written a treatise concerning agriculture and the management of vines. He was the father of the illustrious Cn. Julius Agricola. Univer. Hist.

GRAEDER FIORD, in *Geography*, a bay of West Greenland. N. lat. 63 50'. W. long. 49 30'.

GRAEMSAY, one of the Orkneys, a flat, fertile island,  $1\frac{1}{2}$  mile in length, and a mile in breadth, containing 32 families and 179 inhabitants;  $1\frac{1}{2}$  mile S. of Stromness, near the northern extremity of Hoy. The soil of the interior part is thin and fertile; but the coast is a chain of broken and pointed rocks. It contains a bed of slate, but no fuel.

GRAEN, a town of Hindoostan, in Vishapoor; 24 miles S. of Curer.

GRAESATZ, a town of Croatia; 30 miles S. of Bilhacs.

GRÆVIUS, JOHN-GEORGE, in *Biography*, an eminent critic; was born at Naumberg, in Saxony, in 1632. Having acquired a good knowledge of the learned languages in Germany, he went to Leipsh and studied under Rivinus and Strauchius. After this he passed two years at Deventer, intimately connected with the celebrated Gronovius, to whom he acknowledged himself indebted for a considerable part of his acquisitions, and whom he afterwards succeeded in his professorship. (See GRONOVIVS.) His great reputation induced the States of Utrecht to invite him to their university, and during forty-one years he instructed the young men there in politics, history, and eloquence, refusing various invitations to other seminaries. He died in the year 1703, at the age of seventy-one. He was the editor of many of our best classical authors, as Hesiod, the greater part of the works of Cicero, Florus, Cæsar, Suet-

onius, &c. He compiled also "Thesaurus Antiquitatum Romanorum," in 12 vols. fol. and "Thesaurus Antiquitatum Italicorum," in 6 vols. fol. This work was continued by Burman to the forty-fifth volume. Grævius, as a critic, was modest, and free from pride and pedantry, which are said too frequently to accompany this character. Moreri.

GRAF, in *Geography*, one of the smaller Western islands of Scotland, on the W. coast of Lewis. N. lat. 58 12'. W. long. 6 53'.

GRAFFENBERG, a town of Germany, in the territory of Nuremberg; 11 miles S. E. of Forcham.—Also, a town of Upper Carniola; 19 miles S. E. of Laybach.

GRAFFENECK, a town of Austria; 10 miles S. W. of Sonneberg.

GRAFFER, from the French *greffier*, i. e. *scrifa*, a notary, or *scrivener*. It is used in the stat. 5 Hen. VIII. cap. 1.

GRAFFIGNY, FRANÇOIS D'ISSEMBOURG D'HAPPONCOURT DE, in *Biography*, a literary lady, daughter of a major of the gendarmerie of the duke of Lorraine, was born at Nanci about the year 1694. She married de Graffigny, chamberlain to the duke, a man of violent passions and most brutal disposition, from whom she obtained, after living with him many years, a legal separation. She now went to Paris with mademoiselle de Guise, who was espoused to marshal Richelieu, and soon made her merit known to the wits of the capital. In 1745 she was announced as the author of a Spanish novel. This was followed by the "Lettres d'une Peruvienne," in two vols. 12mo. which were much read and admired, though defective in point of style, and in the metaphysical manner of treating of the passion of love. One of her best pieces was entitled "Cenile," a drama in five acts, which was written in prose. She wrote another, which was entitled "La Fille d'Artide," and which obtained a much less share of public approbation. This lady was of a truly estimable character in private life, and had many respectable friends, even in the highest ranks of society. The emperor and empress honoured her with particular notice, and made her frequent presents. She was an associate of the academy of Florence; and died at Paris in 1758, at the age of sixty-four. Gen. Biog.

GRAFFIO, or GRAVIO, in our *Old Writers*, denotes a *landgrave* or *carl*. "Nec princeps nec grassio, hanc letitiam mutare audeat."

GRAFFIUM, is used for a writing-book, register, or chartulary of deeds and evidences.

GRAFT, in *Gardening*, a name applied to the shoot or scion that is to be inserted into the stock or branch of the tree, in the operation of grafting. It has occasionally the vulgar term of *graft* given it by gardeners.

The word is formed of the French *graffir*, which signifies the same thing; and *graffir*, in this sense, is supposed to have been derived from the resemblance the shoot bears to the point of a penknife, which was anciently called *graffin*. Du Cange goes farther, and derives the ancient *graffin* from *graphium*: *Mengage*, from *graphium*, a Latin word, signifying a little style, or iron bodkin, one end whereof was pointed, and served to write on waxen tablets; and the other flat, serving to efface or rub out what was written.

There are several circumstances to be attended to in choosing the grafts. The shoots or scions that are to be employed in this way, should be selected and cut in a manner that will be directed in speaking of *grafting*; they should never be taken from such as have a disposition to growth, or are in the least degree infected with disease of any kind. See GRASSING.

In the conducting of this process, though the grafts be cut from the stock, and those of the shoot or graft are cut from the

## GRAFTING.

sure, brought into contact and thereby united, as well as those of the latter supplied with nutritious matters from the former, yet their economy remains still the same. Mr. Bradley has considered it as a sort of planting; the shoot or scion rather taking root in the stock or tree into which it is inserted, than uniting itself with it, as is seen by its preserving its natural purity and utility, although fed and supported merely by a crab-stock; which it is supposed depends upon some difference in the vessels of the shoot or scion from those of the stock or tree.

**GRAFTING**, the act of inserting a shoot or scion taken from one tree, into the stem or some other part of another, in such a manner as to unite and constitute a perfect plant of the same kind as that from which the branch was taken.

It is by this practice that particular sorts of curious fruit-trees of different kinds are capable of being raised with a certainty of their being the same, or not degenerating. It has been observed, that though the plants raised from seed are liable to run from their kinds, and afford such fruits as are not worth the trouble of cultivation; those procured from shoots taken from such trees as produce good fruit, never alter from their kind, whatever the stock or tree on which they are grafted may be; as notwithstanding the grafts receive their nourishment from the stocks, their varieties are never altered by them, but continue to produce the same kind of fruit as the tree from which they were taken: the only alteration which they undergo is, that when the stocks on which they are grafted do not grow so full, and afford a sufficient supply of nourishment to the grafts, they do not make so great a progress as they otherwise would do, nor is the fruit they produce so fair, or sometimes so well flavoured, or so large.

This process has the advantage, probably from the supply of nutritious matter being not only more abundant but more regular, of rendering the plants or trees which are thus raised more quick in their arriving at the state of maturity, or that of bearing.

It is on these different accounts that the practice of grafting is principally had recourse to, in raising different sorts of fruit trees, as well as some particular sorts of ornamental plants of the tree and flower kinds. It also affords the means of growing different kinds of fruits and flowers of the same sort, in the same stock or tree, as several varieties of pears and apples, &c.

There are different methods of performing this operation, and which are distinguished by different terms or names, as below.

**Rind, Shoulder, or Crown Grafting.**—This is that mode in which the grafts are set in a tort or circle or crown, upon the top of the cut-off stem or branch.

It is chiefly practised on large trees, when either the head or the large branches are cut off horizontally, and two or more shoots or scions put in, according to the size of the branch or stem: in performing which, the scions are cut flat on one side, with a shoulder to rest upon the crown of the stock; then the rind of the stock is raised up, to admit them between the wood and the bark of the stock, which must be inserted about two inches, so as that the shoulders may meet, and closely join the crown of the stock; and after the whole of the shoots or scions are inserted, all the crown of the stock should be well clayed over, leaving two eyes of them uncovered with it, which will be sufficient for shooting. It is a method of grafting that was much more in practice formerly than at present, owing to the bad success with which it has been attended; for, as the scions are placed between the rind of the stock and the wood, they are frequently blown out by strong winds after they have

made large shoots, sometimes after five or six years growth. Where this method is practised, there should therefore always be some stakes fixed, so as to support the scions until they have almost covered the stock or branch. It is usual to perform the operation in this mode of grafting about the beginning of April, or sometimes a little later.

**Stock, Cleft, or Slit-Grafting.**—This is a mode which is practised upon stocks, trees, or branches, of a smaller size, as from one to two inches in diameter, and may be used with success where the rind of the stock is not too thick, by which the inner bark of the scion will be prevented from joining to that of the stock. In performing it the head of the stock or branch must be cut off with a slope, and a slit be made the contrary way, in the top of the slope, deep enough to receive the scion, which should be cut sloping like a wedge, so as to fit the slit made in the stock; care being taken to leave that side of the wedge which is to be placed outward, much thicker than the other: and in putting the scion into the slit of the stock, great care must be taken to join the rind of the scion exactly to that of the stock; for if these do not unite perfectly, the grafts will not succeed: when this method of grafting is used to stocks that are not strong, it will be proper to make a ligature of bafs, to prevent the slit of the stock from opening: after which the whole should be clayed over, to prevent the air from penetrating the slit, so as to destroy the grafts, only leaving two eyes of the scion above the clay for shooting. It is usually performed about the beginning of March, or sometimes a little later.

**Whip, or Tongue-Grafting.**—This is most generally practised by nursery-men, especially for small stocks, or branches of an inch, half an inch, or less, as the scions much sooner cover the stocks in this method, than in the other. It is performed by cutting off the heads of the stocks sloping; then making a notch in the slope towards the upper part downwards, a little more than half an inch deep, to receive the scion, which must be cut with the slope upward, and a slit made in this slope like a tongue, which tongue must be inserted into the slit made in the slope of the stock, and the scion be placed on one side of the stock, so as that the two rinds of the scion and stock may be equal, and join together exactly; after which, there should be a ligature of bafs put round to fasten the scion, so as that it may not be easily displaced, the whole being afterwards clayed over as in the former methods. It may be performed in the early spring months, with most success.

There are, besides these, some other modes of performing the business.

**Grafting by Approach, or Inarch-Grafting.**—This is sometimes called abscission. It is performed where the stocks that are designed to be grafted, and the trees from which the graft is to be taken, stand so near together, as that their branches may be bent and united. It is most commonly practised on tender exotic plants, and some other sorts which do not succeed in any of the other methods. In performing the work, a part of the stock or branch is slit off about two inches in length, a smooth part of the stock being always chosen for the purpose; then a small notch is made in this slit downward, in the same manner as directed for whip-grafting; the branch of the tree designed to be inarched having a part slit off in the same manner as the stock, and a slit made upward in it, so as to leave a tongue, which tongue should be inserted into the slit of the stock, joining their rinds equally, that they may unite well together; after which a ligature of bafs should be made, so as to keep them exactly in their situation, and afterwards this part of the stock clayed over well to keep out the air. In this method of grafting, the scion is not separated from the tree until

## GRAFTING.

until it is firmly united with the stock, nor is the head of the stock or branch, which is grafted, cut off till the same time, and only half the wood pared off with a slope, about three inches in length, and the same of the scion or graft. But in this method of grafting, the operation is not performed so early in the season as the others; it being done in the month of April, when the sap is flowing, at which time the scion and stock will join together, and unite much sooner than at any other season or period of the year. It is principally employed in raising jasmynes, oranges, and other exotic trees of the harder kinds.

By experience it has been found, that the walnut, fig, and mulberry will take by this method of grafting, while neither of them succeed in any of the other modes. Several sorts of evergreens may likewise be propagated by this method of grafting; but all the trees that are grafted in this way are weaker, and never grow to the size of those which are grafted in the other methods; therefore it is rarely practised, except on such sorts of trees as will not take by the other methods of performing the operation.

*Root-Grafting.*—This, which is a late improved mode, is performed by cutting the clean smooth roots of the stocks in pieces of five or six inches long, and as large, or a little larger, than the graft; then they are whip-grafted, and tied together very close, so as to prevent the wet from affecting the wounded parts, planting them so deep as that the graft, which should be four or five inches long, may be about half buried. In this way, the grafts themselves will root, and a nearer similitude be preserved to the tree, whence the grafts are taken; and after two or three years, the stock may be cut quite away, and the graft left to maintain itself. In practising this method, the grafts should be an inch or two longer than the others.

*Season of Grafting.*—The period or season for grafting should always be regulated by the state of the weather. From the climate being so uncertain in the spring, it is best to defer it till the circulation of the sap is brisk, and the buds of the stocks begin to break into leaves, attention being had that the weak shoots of tender trees will not admit of being so long cut as the more hardy, and that the operation should never be performed while it actually freezes or rains, or there is snow upon the ground.

*Proper Grafts.*—In providing these, care should be taken that they are shoots of the former year, as when they are older they never succeed well; that they be always taken from healthy fruitful trees, as when the trees are sickly from whence they are taken, the grafts often partake so much of the distemper, as not to get the better of it, at least for some years; that they be not taken from young luxuriant trees, whose vessels are generally large, continuing to produce luxuriant shoots, and seldom proving fruitful; and that they be taken from the lateral or horizontal shoots, rather than the perpendicular ones. They should be cut off from the trees before their buds begin to swell, which is mostly three weeks or a month before the season for grafting; consequently when they are cut off, they should be laid in the ground, with the cut part downwards, burying them half their length, and covering their tops with dry litter, to prevent their drying; if a small joint of the former year's wood be cut off with the scion, it will preserve it the better, and when they are grafted, this may be cut off; for, at the same time, the scions must be cut to a proper length before they are inserted in the stocks; but, till then, the shoots should remain of their full length, as they were taken from the trees, which will better preserve them from shrinking: when the scions are to be carried to a considerable distance, it will be proper to put their ends into a lump of clay, and to wrap them up in

moss, which will preserve them fresh for a month or longer; but these should be cut off from the tree earlier than those which are to be grafted near the place where the trees are growing. It is, however, always the best practice to cut the grafts as near the time of their being inserted into the stocks as possible, as by that means they succeed with much more certainty.

*Stocks proper for Grafting upon.*—The stocks are the trees or plants for grafting upon; which are either such old trees as are already growing where they are to remain, but the fruit of which is intended to be changed; or such young trees as have been raised in the nursery as a supply to the garden. In the former case, there is no other choice than that of the branches, which should be such as are young, healthy, well-situated, and have a smooth bark. Where these trees are growing against walls or espaliers, it will be proper to graft six, eight, or ten branches, according to the size of the tree, by which they will be much sooner furnished with branches again, than when a less number of shoots or scions are put in; but in standard trees, four, or at most six scions will be sufficient for the purpose.

In choosing young stocks for grafting upon, such as have been raised from the seed, and that have been once or twice transplanted, should always be fixed upon for the purpose.

After these, those stocks which have been raised from cuttings or layers should constantly be preferred; but those which are suckers from the roots of other trees should be rejected, as they are never so well rooted as the others, and constantly put out a great number of suckers from the roots, by which the borders and walks of the garden will be always pestered during the summer season. These, besides being unprofitable, take off part of the nourishment from the other trees and plants.

And where these stocks have been allowed a proper distance in the nursery where they have grown, the wood will be better ripened and more compact than those which have grown close, and have been drawn up to a greater height. The wood of these will be soft, and their vessels large; so that the scions grafted into them will shoot very strong; but they will be less disposed to produce fruit than the others; and when trees acquire a bad habit at first, it is difficult to reclaim them afterwards. The stocks most adapted to each sort will be explained under their particular genera, and in considering the nature of stocks. See STOCKS.

*Impliments proper for the Work.*—These are principally a neat small hand-saw, for cutting off the heads of large stocks; a good strong knife, with a thick back, to make clefts in the stocks; with a sharp pen-knife, or budding-knife, to cut the grafts with; and a grafting chisel and snail mallet. Other sorts of implements are sometimes necessary in performing particular sorts of grafting.

But besides these tools, other sorts of materials are wanted in performing the business, such as bals-strings, or woollen yarn, to tie the grafts with; and a quantity of good tough clay, which should be prepared a month before it is wanted, and kept turned and mixed, like mortar, every other day, in the following manner:

A quantity of strong good clay, in proportion to the quantity of trees intended to be grafted, should be provided, and some new well-sed horse-dung broken in amongst it; and if a little straw or hay be mixed amongst it, it will hold together the better. The addition of a quantity of salt will also prevent the clay from dividing in dry weather. This should be stirred and mixed together, putting water to them occasionally, in the manner of making mortar. The whole should be hollowed like a dish, filled with water, and kept

every

every other day stirred. It should be carefully kept from being exposed to froil or drying winds; and the oftener it is wrought over the better it will become.

Some have lately made use of another sort of composition for grafting, which has been found to answer the intention of keeping out the air better than the clayey mixture. It is composed of turpentine, bees'-wax, and rosin melted together; which, when of a proper consistence, is put on the stock round the graft, in the same manner as the clay is usually applied; and though it be not above a quarter of an inch thick, it keeps out the air more effectually than the clay; and, as cold hardens it, there is no danger of its being hurt by froil, which is very apt to cause the clay to crack, and fall off; and, when the heat of the summer comes on, it melts and falls off without any trouble. In the using it, a tin or copper pot is necessary, with a convenience under it to keep a very gentle fire with small coal; otherwise the cold soon condenses the mixture. It is necessary not to apply it too hot, lest the graft be injured. A person a little accustomed to this composition, applies it very fast; and it is much easier for him to work with than clay, especially when the season proves cold.

In the business of grafting it is found, that in long-continued dry seasons the grafts are liable to fail in taking, which is sometimes probably owing to the improper choice of the grafts, as well as to the dry weather. Great care should of course always be taken not to graft with weak shoots, particularly those taken from near the top, but such as are taken from the lower end of the shoots, and in which the wood is plump and fresh; such as are shrivelled seldom or ever take well. When any have missed in the spring, it has been advised to cut off, about the middle or latter end of June, some fine, healthy grafts of the sorts that are wished to graft with, and to open the bark in the same manner as for budding, inserting the graft with a piece of the former year's wood on it, and after this has been done, to rub in with a brush some of the composition of Mr. Forsyth in a liquid state; then to warp bafs round it, as is done for spring grafting, leaving about three eyes in the shoot, which should be tied on with the bafs as light as possible; then covering the outside of the bafs, thus tied up, with the composition to the thickness of about one-eighth of an inch, as well as the end of the shoot, to exclude the air and wet. In about three weeks or a month, the grafts should be looked over, to see if they have taken. When the graft begins to swell, it will throw off the composition; in which case always remember to apply more to prevent the air from penetrating the incision or wound that has been formed.

About the month of September it should be examined whether the wounds are all healed up, and the two barks perfectly united; which, if they are, slacken the bafs; and when they are perfectly healed up, it may be wholly taken off; but if not, the bafs must be again tied on, and covered with a composition as before, letting it remain till the following spring. It may then be taken off; and if it be found that the two barks have separated during the winter, with the point of a sharp knife, all the brown part of the bark (which, if left, would infallibly bring on the canker) should be cut out, and the composition rubbed into the wound. When the grafts have produced strong leading shoots, the tops of them should be pinched off with the finger and thumb; but if they have not shot strong, they should not be cut till the spring, when they may be cut down to three or four eyes, according to their strength, to make them produce horizontal shoots, and form handsome leads. This sort of grafting should always be performed in moist or cloudy weather, if possible, as under such circumstances the operation mostly succeeds better.

It has been remarked by Mr. Forsyth, that rubbing a little of his composition into the incision will effectually prevent the canker, and in applying it round the graft, a much less quantity is sufficient than of the clay; as it need not be more than three inches round in grafting small stems or shoots, and in proportion for those which are larger. It keeps the scion moist. When used in grafting, it should be of such a consistence as to work easily with the hand, or a knife, or small trowel, rather softer than grafting-clay generally is. This method, on a fair trial, will, he thinks, be found "a sure, neat, and expeditious way of grafting."

In grafting, or budding, they should be performed as near to the upper side of a bud as possible, and the most proper place for inserting the scions or buds is at the joints, a little above the cross shoot.

And in respect to the sorts of trees that will succeed upon one another, it may be observed that all such as are of the same genus, that is, which agree in their flower and fruit, take upon each other; hence all the nut-bearing trees may be safely grafted on each other, as well as all the plum-bearing trees, as the several sorts of plums, almond, peach, nectarine, apricot, &c.; but as many of them are subject to admit gum from the parts wounded, as the peach and nectarine kinds, it is found the surest method to bud or inoculate them.

All such trees as bear cones also do well upon each other, though they may differ in one being evergreen, and the other shedding its leaves in winter; as in the cedar of Libanus, and the larch-tree, which are found to succeed upon each other; but they must be grafted by approach, as they abound with a great quantity of resin, which is apt to evaporate from the graft, when separated from the tree before it is joined with the stock; whereby they are often destroyed. The laurel likewise on the cherry, or the cherry on the laurel. All the mast-bearing trees are also found to take upon each other, and those which have a tender soft wood do well if grafted in the common way; but such as are of a firm texture, and are slow growers, must be grafted by approach.

It is likewise by this method that many kinds of exotic trees are not only propagated, but also rendered hardy enough to endure the cold of our climate in the open air; as by being grafted upon stocks of the same kind which are hardy, the grafts are rendered more capable of enduring the cold, and the general effects of the atmosphere.

GRAFTING Wax. See Wax.

GRAFTING Tool, in *Engineering*, signifies a kind of spade, made very strong and curving, used in digging canals, often called only a *tool*; see fig. 50. CANALS, Plate VII.

GRAFTON, in *Geography*, a town of America, in Windham county, Vermont, chartered by the name of Tomlinson, but assuming its new name in 1791. It contains 1149 inhabitants, and lies W. of Rockingham, adjoining.

GRAFTON County, a county of New Hampshire, bounded N. by Canada, S. by the counties of Strafford, Hillsborough, and Cheshire, W. by the state of Virginia, and E. by the district of Maine. It is divided into 50 townships, and 17 locations, and contains 23,093 inhabitants.

GRAFTON, a post-town in the county above-mentioned, 13 miles S.E. of Dartmouth college, and 19 S.W. of Plymouth. It was incorporated in 1778, and contains 682 inhabitants. Lapis specularis, of the best quality, is found in this town; it lies in a mountain about 20 miles E. of Dartmouth college, adhering to the rocks of white or yellow quartz, and lying in laminae, like sheets of paper.

GRAFTON, the *Hoffawamisco* of the Indians, a township in Worcester county, Massachusetts, containing 985 inhabitants; 40 miles S.W. of Boston.

GRAFTON, *Cape*, a cape on the coast of New Holland,

is called by Cook in 1770. S. lat.  $16^{\circ} 57'$ . W. long.  $214^{\circ} 6'$ .

**GRAFTON Island**, the most northerly of the British islands, in the East Indian sea. N. lat.  $21^{\circ} 8'$ . E. long.  $118^{\circ} 14'$ .

**GRAGNANO**, a town of Naples, in Principato Citra; 11 miles W.S.W. of Salerno.

**GRAHAM'S ISLAND**, one of the Aladin islands, in the Mergui Archipelago, about 6 miles in circumference. N. lat.  $9^{\circ} 19'$ .

**GRAIG**, or **GRAIGNAMANNA**, a post-town of Ireland, in the county of Kilkenny. Here is a good bridge over the Barrow, and the tide flows up. It is 53 miles S. by W. from Dublin.

**GRAIN**, **JOHN BAPTIST LE**, in *Biography*, was born, in 1565, at Paris, where he was educated with great care, and in early youth he was introduced to court, and attached himself to the service of Henry IV. He was appointed by that prince to the office of counsellor, and master of requests in ordinary to the queen, Mary de Medicis. His employment was in writing, and in attending on the education of his children. On their account he drew up Memoirs relative to the history of France, which remained in MS. till the chancellor de Sillery persuaded him to publish a part of them. His first publication, which he printed in his own house, was entitled, "Decade contenant l'Histoire de Henri le Grand, Roi de France et Navarre, IV. du Nom." fol. 1614, in ten books. It comprizes the period from the peace in 1559, to the king's death in 1610. He published a second decade, including the history of that king's reign, in 1618. The former decade was presented to the young king Lewis XIII. who was highly delighted with the freedom displayed by the author, and it was at his desire that the other was made public. Le Grain, though fortunate in pleasing his sovereign, made himself many enemies by the honesty and candour which he displayed in the narration. Attempts were made to procure a censure upon it from the Sorbonne, but they were unsuccessful, that body declaring that they found nothing in it deserving of censure. The real grounds of the objections to it were that the author had supported the liberties of the Gallican church; that he had censured attempts to introduce into France those articles of the council of Trent, which had been rejected; — that he disapproved the establishment of new religious orders, and was not favourable to the persecution of heretics. For these sentiments, which ought to have endeared him to his countrymen, he was continually harassed by bigots, till at length an order was procured from the king for the suppression of all the copies of his work, which remained in his hands. The treatment which he experienced disgusted him with the court, and he went into retirement on his estate of Montgeron, where he died in 1642. He left in MS. a manifesto relating to all the proceedings respecting his book, which is said to display in glowing colours the discouragements attending honest historians under an absolute monarchy. He left likewise the third decade of his history, and some chronological pieces in MS. Moreri.

**GRAIN**, **GRANUM**, primarily denotes a fruit, or seed, growing in a spica, or ear.

In this sense, grain comprehends all sorts of corn; as wheat, rye, barley, oats, &c.

**GRAIN**, *Structure of*. There are three particulars observable in every grain, whether it be wheat, barley, oat, or whatever else of that kind. These are, 1. The outer coat or pellicle, which contains all the rest. This in the same species of grain is found to be very different in thickness in different ears, and as it has grown in different soils.

2 The germ or bud; this is always hid within the seed or grain, and is the plant in miniature that is to arise from it. (See **BUD** and **GERM**.) And, 3 The meal, or that farinaceous matter which is inclosed in the skin, and which surrounds the germ, and serves to give it nourishment when first put into the earth, before it is capable of drawing it from the earth itself. Dr. Grew, in his *Anatomy of Plants*, has treated of this at large. See *ELUCIDATION of Plants*, **GERMINATION**, **VEGETATION**, &c.

The whole structure of the plant which produces these seeds is equally admirable. The chaff is first admirably adapted to fluid and defend the seed as long as that is necessary, and then to let it fall; and the husk, formed below and round, is necessarily at once light and strong, capable of sustaining the ear, without absorbing too much of the juices destined to its nourishment; and the beard, of many kinds are a defence against the bird, that would otherwise destroy the seed before its ripening. The covering of the seed is formed of two membranes, which meeting in a line on one part of the seed, form together that furrow we see in it. This is the place at which the seed is to burst open on being moistened. Had not nature provided this means of the germ's coming out, the toughness necessary to the coat of the seed, as a defence from injuries, would have suffered the farinaceous matter and the germ to rot together, within it, before it would have given them way to come out, and for the germ to grow.

Nor is this the only use of this place of opening. The great Creator of all things has provided these seeds, not only for a supply of the same species of plant, but for our food, and for that of birds, &c. We have art enough to erect machines for the reducing of the farina to powder, and the freeing of it from its covering membrane; but the birds eat it as it is, and it would pass through them whole, and without doing them any good, were it not that the juices of the stomach swelling it up, it bursts open at this furrow, and all the nutritive matter pours itself out. De Landes, *Trait. Phys.* p. 62. See **FARINA**, **FECULA**, **FLOUR**, **BREAD**, &c.

For the laws relating to the importation and exportation of several sorts of grain, as wheat, barley, oat, &c. See **CORN**.

The cleaning and preserving of grain in a proper sweet condition have long been objects of considerable importance, but it is probable that the latter cannot be effected for any great length of time.

Different methods of managing grain, after being threshed out, are practised by farmers; some keeping a large proportion of it in the chaff on the barn floors, while others, after having it cleaned, put it into sacks, and place them in the same situation, or in some room appropriated to the purpose, until they can be sent to the market. But each of these methods is liable to much objection; as when it remains for any length of time on low damp floors, it must obviously soon become musty, however much precaution is taken to prevent it, whether it be in sacks, or in a loose state without being cleaned.

There is another practice sometimes employed in the more northern parts of Scotland, according to the author of "Modern Agriculture;" which is, that of twirling straw into large bands, or ropes, and coiling them up in the manner of the cables of ships, placing the grain, when threshed and cleaned, within the coils, in a sort of well, as it were. But as the grain in this way rests on the ground or floor, and, of course, is liable to imbibed damp, it is not less objectionable than the others, while it is much more troublesome, and more exposed to loss.

It has been advised, in order to preserve grain in a proper state after threshing it out, to have it as expeditiously as possible cleaned from the chaff, when the air is in a dry state, and put into a room, chest, or bin, which is perfectly dry and free from any sort of moisture, until it can be properly placed in the granary, or be sent away for sale. This should always be directed as early as possible, as, by delaying the cleaning of the corn, the sample is very liable to be injured.

The cleaning of the grain is performed in several different ways; but where threshing-machines are in use, they are now mostly contrived in such a way as to execute it at the same time the threshing is going on. The winnowing-machine is also frequently employed for the same purpose, and answers perfectly well. And in some situations the *casting-sieve* and *spry*, or flat broom, as well as the *scuttle*, are made use of, the broom serving to remove the chaffy parts and the more minute strawy particles which are separated from the grain by the wind. This method can, however, only be employed with advantage where there is plenty of barn-room; under other circumstances the winnowing-machine is far more beneficial and proper. The practice of cleaning grain on the barn-floor, by means of the wind, is not only tedious and troublesome, but an extremely imperfect method.

In whatever way the extraneous matters have been removed from grain, it should, as soon as the operation has been performed, especially in barley and wheat, be put through a screen-machine, which, in most of the more improved threshing and winnowing-machines, is provided with this intention, and is thereby rendered free from all sorts of small seeds and other foreign matters. In this way the ova of different sorts of insects are also removed, and the production of the weevil, moth, beetle, &c. prevented, as well as the destruction which they commit while in their vermicular state, guarded against.

Screen machines may be had separately from the others; but the work of cleaning the grain is the most readily, cheaply, and conveniently performed, where they are connected with the other necessary machinery.

It has been suggested, that as the prevention of all sorts of corn from being affected by the different causes that have a tendency to injure it, when laid up for the purpose of keeping, depends upon its being put by in a perfectly dry condition, and on its being afterwards preserved in that situation; it is of much consequence, in these views, to keep it, from the period of its being threshed out of the straw, as much as possible from coming in contact with the earth, stone, or any other sorts of floors that are placed near to, or upon the ground, as they have constantly a great disposition to communicate moisture, and in that way injure the grain that rests upon them.

It is likewise found to be a highly beneficial practice to prevent, as much as possible, the entrance of the atmospheric air, whenever it is much loaded with humidity; as from the vast extent of surface that is exposed to its action, it is easy to perceive that it must be highly prejudicial to the corn, by imparting its moisture to it, as a sort of mucus, or mouldiness, is thereby brought on, that is attended with a musty disgusting smell, and that prevents its keeping in a proper manner. In regard to the means of prevention, they must be different in different cases; but much may be done in the last of the above situations, by cautiously avoiding the too general practices of permitting the corn to remain upon the threshing-floors in the barns, particularly where they are of the earthy or stoney kinds, too long after it is threshed out, before it is cleaned from the chaff, and other useless

matters: or, after it has been cleaned, by preventing its being deposited upon them, either in the loose state, or in sacks. And farther, by having great regard to the dryness of the air when the business is performed.

In instances of the latter kind much is capable of being accomplished by having proper apparatus, such as slides, shutters, and other suitable contrivances, fixed in the pipes, funnels, and other openings, designed for the purpose of ventilation in the corn-chambers and granaries; which should be preserved, constantly shut in a close manner at all times when the air is much impregnated with watery particles, so as to prove hurtful to the grain. Damp and frosty weather are, of course, always improper for exposing grain to the air in, as it must, in such seasons, do great mischief. But, besides air, light is essential in the preservation of grain in these circumstances, as, where it is not admitted pretty freely, a kind of vegetable mucus, or mould, as already noticed, is liable to fix upon the grain, and injure it greatly. The ingenious author of the "Philosophy of Gardening and Agriculture," has remarked, that this possesses the same property as that of other funguses, of growing where there is scarcely any change of air, and in places where there is little or no light, provided there be the necessary degree of warmth and moisture. On the same principle, with the intention of retaining the grain in a state as free as possible from dampness, it is suggested by the same writer, that it might be useful to have well constructed stoves in the bottom parts of corn-chambers and granaries, for the purpose of occasionally communicating such moderate degrees of heat to the grain as would be sufficient to dry up and expel any injurious moisture that it might have attracted in damp wet seasons. On this idea it has, indeed, long ago been recommended as supported by experience by Mr. Tull, to preserve wheat, by exposing it to the action of a sun-dry degree of heat upon a hair-cloth, in a malt-kiln, produced by the combustion of clean straw, for such a length of time as may be necessary to remove the dampness, as from four or five to ten or twelve hours, according to the proportion in which it may exist. But in this method the heat should be constantly kept so moderate as not to destroy the vegetative property, or life of the grain, as, if that were the case, its putrefaction and decay would be promoted. The degrees of heat that would be the most adapted to answer the purpose, in different cases, would be easily regulated by those instruments which are in general use for measuring the heat and moisture of the atmosphere. These principles assist us much in reconciling the differences of opinion that have so long prevailed in respect to the use of air in the preservation of corn in granaries, as they sufficiently show, that when admitted in its perfectly dry and elastic state, it must be particularly useful in carrying off any moisture or disagreeable smell that the grain may have contracted by remaining closely heaped together for some length of time; as, by the stirring that usually accompanies the ventilation, it must necessarily operate in a very extensive manner; but that when applied in its moist heavy state, it must be detrimental in an equally proportionate degree, by imparting its humidity to the grain, and thereby causing a sort of mustiness.

It is probable that the ventilation of grain is the most completely effected by stirring it by means of proper slides, doors, or other similar contrivances made in the floors, windows, and other openings of the granaries or corn-chambers; but it is capable of being accomplished in a more slow and less economical manner by shovels, rakes, and other similar tools. And in order that the work may be more readily and more effectually performed, the grain should not be



spread out too thickly over the floors of the granaries and corn-rooms. From one to two feet, or two feet and a half in depth, is considered fully sufficient for the purpose, in proportion as it becomes more dry and the moisture more dissipated. When grain is heaped together to too great a thickness at first, from the natural moisture which it contains, it is frequently apt to heat, and thereby greatly injure the sample. Frequent screening should likewise be had recourse to immediately after its being deposited in the corn-rooms, and occasionally at other times as circumstances may demand.

Other points have been suggested by Doctor Darwin, as necessary to be attended to in this business, in order to perform it in the most effectual manner; such as those of having the doors, windows, and other principal apertures of the buildings placed in such a manner as to face the south, and as close to the ceiling as possible, so that the rays of the sun may enter with the greatest freedom. And in addition, the linings of all such corn-rooms should constantly be formed of such materials, as have no tendency from their coldness to precipitate the moisture from the atmosphere, which is frequently the case with particular substances, when warm, damp, south-west winds take place after cold or east ones, and in that way impart it to the grain that comes in contact with them. It is also equally necessary in all such cases that the entrance of wet and moisture should be prevented in an effectual manner, by having recourse to proper sheltering boards, slides, and other contrivances of the same kind.

There is likewise a particular sort of management necessary in the turning over and stirring of grain in order to its complete ventilation, as when the corn is first placed in the rooms it stands in need of much more frequent turning over than afterwards, when it has parted with a considerable proportion of its moisture and is become somewhat dry. For the first month or six weeks, once or twice in every week or ten days may be sufficient to answer the purpose; but afterwards for four or five months longer, about once in the fortnight may commonly be sufficient, and from that period only once in the month, except when the season proves very moist, warm, and of course improper for keeping the grain well.

In order to accomplish this business different methods are in use; it is the custom in some places to have empty spaces left on the sides of the heaps of grain and other parts into which they may be turned over when necessary; while in others, square holes are formed in the ends of the floors, and round ones in the middle, by which means the grain is thrown from the upper to the lower chambers, and back again, and of course becomes agitated and exposed to the air in a more perfect manner. This is a method that is practised with success in some parts of the county of Kent. As, however, in these modes such frequent turnings are not only extremely troublesome, but expensive, in consequence, especially in the first case, of being performed by the shovel, the plan of having sliding shutters in the middle of the different floors so contrived, as to have an inclination towards the centre of the granaries, has been had recourse to; by the occasional removal of which, and the opening of the windows and ventilators, the grain is turned and exposed to the influence of the air at the same time with great ease, convenience, and dispatch.

This mode of preserving grain was long ago found by Monsieur du Hamel to answer perfectly well, even in cases where it had been laid up in a moist, damp, and improper state.

There can be no doubt, however, but that grain may be preserved without having recourse to the means of ventilation, by depositing it, when in a perfectly dry state, in deep wells, pits, and caverns that are free from any sort of damp and moisture, and so far below the surface of the ground that it cannot be affected by the heat or the changes that take place in the seasons. But though grain has been known to have been preserved in this manner for a great length of time in those countries where it is the practice to have it stored up for times of scarcity, it is by no means either a very safe or convenient method.

It must be observed, however, that in whatever manner grain is secured, it is essentially necessary that care should be taken that such portions as are in a soft damp state, or which have been badly harvested, should not, on any account, be laid up with that which is in a dry condition and perfectly sound; as from the quantity of moisture that is contained in it, and the tendency to germination that takes place in consequence of it, a ruddy bad smell is liable to be imparted to the whole, and the sample either totally, or in a great degree destroyed.

The practice of exposing grain to the free action of the atmospheric air, has been discarded by some in consequence of the ova or eggs of insects being liable in that way to be deposited among the grain, but it would seem more probable, when the economy of such insects is well considered, that their ova were either deposited originally among the grain in such situations, or brought in with different parcels of it from different places. On this account it is evident that great caution should be used in turning fresh parcels of grain for being laid up, and that the screen should be constantly employed before putting it into the rooms.

It is, however, pretty certain that where grain is to be preserved for much length of time, though it may without doubt be safely kept in the ways that have been already mentioned; yet it is most probably not only a much better, but more certain and economical method to let it remain unthreshed from the ear in the stacks in which it has been built, particularly where they rest upon fladdles that are properly constructed for the purpose.

It may be proper to observe, that where grain is to be long preserved after being threshed out, there should always be proper buildings of the granary kind provided for its reception, the sizes of which should be proportioned to the extent of the farm, being constantly adequate to contain about one-half of the grain-produce after it has been threshed out and cleaned.

In cases where the grain is ground and preserved afterwards in the state of meal, it is the usual and by far the best mode to pack it very closely by means of treading or ramming it into dry, close, small rooms, or large chests, as, in this way, when laid up in a proper condition, it will keep for a very great length of time quite safe and free from mischief.

But, notwithstanding the custom of preserving grain in stacks and granaries, from the convenience of it, may, in some instances, be beneficial, not only to the farmer, but the public, and, consequently, in some measure necessary, it is clear from the trials that have been already made, that the storing of grain in either way should be carried to as small an extent as possible, as it has been ascertained that there is a constant decrease taking place in its weight from the period at which it has been harvested or laid up, but that this loss is far greater at first, than after it has been kept some time.

In the second volume of the new edition of *Geography*

# G R A I N.

Essays, published by Doctor Hunter, the loss is stated by Mr. Holt to be in the following proportions in different sorts of grain :

### In Wheat.

	lb. oz. drs.
On being rubbed out in the hot-sun, and weighed the 31st of August, 1789, soon after being cut, afforded	0 2 11
On being weighed again on the 18th of October	0 2 7
Loss of weight, <i>per</i> bushel, of 70lbs. nearly	6 8 3
Or almost one-tenth of the whole in forty days.	
Of this wheat, thirty-two grains weighed one penny-weight.	

It is, however, remarked, that this is the greatest possible loss that the grain can sustain, as though it was in a full state of maturity or ripeness, it had neither had the benefit of being dried by exposure to the sun after being cut, nor undergone the process of fermentation after it was put together.

### In Wheat.

	lb. oz. drs.
Another quantity, weighed on the 22d of October, produced	0 6 3
Weighed again 24 days afterwards, afforded	0 6 0
Loss in that time <i>per</i> bushel, at the rate of	2 11 15
A further quantity, weighed on the 8th of January, 1790, produced	0 2 2
Loss <i>per</i> bushel, on being weighed again 32 days afterwards, at the rate of	2 0 15

### In Barley.

On being weighed on the 2d of September, under similar circumstances, produced	0 2 2
On being weighed again on October the 18th, afforded	0 1 12
Loss of weight <i>per</i> bushel of 60 lbs. Or about one-seventh of the whole in 47 days.	8 4 22
Twenty-four grains of this barley were found to weigh one penny-weight two grains.	

### In Oats.

With this sort of grain no experiment appears to have been made by the writer, but there can be no doubt but that the loss must be equally great as in any of the other sorts.

The results of these trials render it sufficiently evident, that the more expeditiously grain is brought to the market, the less is the loss which is sustained by the cultivator. Of course it should never be laid up or kept in any other way longer than circumstances render it necessary. But in addition to the loss that has been seen to occur from the gradual diminution in the weight of the grain in consequence of the dissipation of the more moist particles which it contains, there are others that arise occasionally from the ravages of different kinds of vermin, and the effects of damps, mildew, and several other causes.

In regard to the preservation of grain from the depredations of insects, and other similar animals, it may probably be the best accomplished by a timely and frequent use of the screen, with proper ventilation, as has been noticed above. Where the injury is produced by the weevil, the moth, or the beetle, it has always ceased at the period when these vermin appear, as they are, when in this state of existence, merely propagators of their several respective kinds of vermiculi, which, while they continued in that state or form, produced the injury.

In their ultimate or insect state they eat or consume very little, their business being principally that of depositing their ova or eggs, which they do by a sort of unerring instinct, in situations where the large collections of grain are sure to furnish food for their successors during the period in which they are in the vermicular state. It is consequently a matter of great moment to prevent the generation of them, by the destruction of the eggs before they are hatched, which is usually the best performed by having recourse to the screen, and exposure to a free air, as has been already shewn. The frequent stirring of the grain breaks the cohesion of their ova, by which the nidus of such minute vermiculi is destroyed, as on hatching they collect together, and spin or weave numerous nests of a cob-web-like substance for their own security and protection. And a great number of grains are attached together by them to these nests, by an infinity of small threads, both for their safety and food. Consequently, when their habitations are broken and separated by the use of the screen, they fall through its small interstices, and are capable of being easily removed with the dust and other refuse matters: and such as escape the early screenings are destroyed by those that follow, and the grain of course little injured by the operation, being only rendered more clean and free from impurities. See *HARVESTING of Grain, REAPING of Grain, and STACKING of Grain.*

GRAIN is also applied to the fruits or seeds of divers plants, as a grain of millet, of pepper, &c.

GRAIN is also extended to a minute body, or parcel of a body pulverized. In which sense we say, a grain of sand, a grain of salt, a grain of gunpowder, &c.

GRAIN denotes also a small weight, used in estimating divers substances.

The grain is the smallest of all weights known in England. It is taken from the weight of a grain of wheat, gathered out of the middle of the ear, and well dried. By stat. 12 Henry VII. cap. 7. every sterling or penny-weight was to weigh thirty-two such grains; but now twenty-four grains make a penny-weight, and twenty penny-weights an ounce. See *PENNY and WEIGHT.*

The grain is troy weight, and used in the weighing of gold, silver, jewels, bread, and liquors.

Among the ancients, the grain was the fourth part of the siliqua, or twelfth of the obolus, and the twenty-second of the drachma. It coincided with lens.

Fernelius, lib. iv. cap. 6. Method. Medend. affirms it as a thing known and certain, that the grain is of the same weight every where: but he is mistaken. Mr. Greaves, in his treatise of the Denarius, in his Miscell. Works, vol. i. p. 276. has shewn, that 179 Dutch grains, which Snellius had found to be the weight of a Philip of gold, only amount to 134½ English grains. Add, that Mons. Perrault has computed the French grain to be less than the English, and yet bigger than the Dutch; to the English, it is as 158 to 134½; and to that of Holland, as 158 to 179. See *WEIGHT.*

The grain used by the apothecaries is the same with that of

of the goldsmiths; though they make a difference in the weights raised from it. Thus, 20 grains, with them, make a scruple, 9 : 3 scruples, a drachm, 3 : 8 drachms, an ounce, 3, &c.

The carat used in estimating the fineness of gold, as well as in weighing diamonds and precious stones, is also divided into four grains; and the carat is about the one hundredth and fiftieth part of an ounce troy, according to Mr. Jeffreys, in his treatise on Diamonds and Pearls.

Hence, the jewellers' grain is to the troy grain, inversely, as 600 is to 480, that is, directly as four to five.

GRAIN, in English troy and apothecaries weight, is the 480th part of a troy pound = 20 mites = 480 droits = 9600 perits = 230400 blacks, of the assayits, = .820386 French grains = .06475 grammes of the new weights of France = .000142857 pounds avoirdupoise.

GRAIN, a weight in France, = 1.21893 English troy grains = .00017413 English pounds avoirdupoise = .0531217 grammes of the new weights.

GRAIN is also used for the figure or representation of grains on stones, fluffs, leathers, &c. Thus we say, morocco has a bolder and richer, that is, a larger grain, than shagreen.

In some marbles, the grain is very fine; in others coarser. Steel is known by its grain, which is much finer than that of iron.

GRAIN, in *Mining*, is applied by quarry-men and masons to the minute figures in most blocks of stone, by which they are disposed to split most easily in some certain direction, than in any other, as wood is disposed to split in the direction of its grain. Beat, sheet, lamella, and stratula, are other terms of almost similar import. Experienced masons can generally discover the grain of the most homogeneous or perfect free-stone blocks, or such as will cut with equal ease in any direction, and this they often do, by observing the directions of the very minute plates of mica, or silver, as they call it, which are frequently found arranged, in the stone, in the direction of the grain, or beat of the stone; which, it must be observed, is not always that of the beds or stratification, many rocks having stratula which cross their beds obliquely, often at an angle, of from 30° to 45 with the bed or plane of the stratum; and such stratula, not uncommonly, dispose the stone to split into flags or paviers or even tile-stones, or slates for houses, and into the most thin and perfect lamina. Sometimes these oblique stratula cross stone beds of very great thickness, and have been frequently mistaken, by inattentive observers, for the stratification itself, as Mr. Kirwan observes of the argillites or slates, p. 283 of his "Geological Essays." See STRATULA and STRATA.

GRAIN, *Cochineal*. See COCHINEAL.

GRAIN, *Scarlet*. See SCARLET.

GRAIN, *Oil*, in *Botany*. See MÛLLERGRUM.

GRAIN, *Tin*. See SKEAMING and TIN.

GRAINS, in the *Materia Medica*, or the seeds of vegetables, are distinguished into emulsive, which yield a considerable quantity of mucilage and oil, which may be separately extracted from them; such are almonds, and the seeds of almost all fruits; and farinaceous, which are entirely composed of a dry substance, easily reducible into a fine powder, called meal. Of this kind are the grains of all graminous and leguminous plants.

GRAINS, in *Rural Economy*, a term applied to the remains of different substances of the grain kind after they have been employed in the brewing of beer, or the distillation of spirituous liquors. They are in much use by the farmers and cow-keepers near large towns for the feeding of various de-

scriptions of domestic animals, such as milch cows, hogs, fowls, geese, ducks, &c. as well as sometimes for the fattening of neat cattle. In this last intention, it is however necessary to mix other substances with them, such as good pollard, coarse ground oatmeal, &c. It must be observed, that these matters can only be made use of while they are in a fresh state with advantage. It is of course necessary, particularly during the more hot summer months, to employ such means as are proper for preventing their running into a state of fermentation, which would render them wholly useless. This is usually effected by having them well pressed and trodden down into large vats and cisterns formed deeply in the ground, and covered from the action of the air. In this way they may be kept perfectly sweet and fit for use for a considerable length of time. See COW-KEEPING and STALL FEEDING.

GRAINS of *Paradise*. See MEDEA.

GRAIN-Coast, *Malaguetta*, or *Pepper-Coast*, in *Geography*, a country of Guinea, extending about 300 miles along the coast of the Atlantic from the vicinity of Cape Palmas to that of the river Mesurada, but its limits are not precisely ascertained; and bounded by the country of the Foulahs, or the Sierra Leona country on the west, and the Ivory Coast on the south-east. It derives its name from the great quantity of Guinea pepper which it produces. The climate is insalubrious, and is found to be particularly noxious to Europeans. The productions of this country are pease, beans, gourds, lemons, oranges, bananas, and a kind of nut with a thick shell, which is a most delicious fruit. The palm-wine and dates are in high perfection; cows, hogs, sheep, and goats, are very plentiful; but this country derives its chief wealth from the abundance of Guinea pepper, or grains of Paradise, called Malaguetta by the Portuguese, which it produces. It supplies also a considerable quantity of pimento. Its commerce has also very much consisted in ivory and slaves. The natives are reckoned temperate and abstemious; but they are said to allow Europeans every kind of familiarity with their females, and to invite them to love-banquets with their own wives and daughters. They are actuated in common with other negroes, by an invincible propensity to steal, not only from strangers and foreigners, but from the nearest of their own kindred. Their language is peculiar to themselves, and difficult of attainment. Their trade is carried on by signs and tokens, some of which are not very decent. The natives are, in general, well-formed, and handsome in their persons and features. Their common dress is a "paan," or unshaped piece of cloth round the waist. They are extremely subject to hernias and ruptures. They have among them some excellent mechanics, some of whom understand and practise the art of tempering steel, making arms, and all steel instruments, and constructing canoes; others have introduced improvements in husbandry, particularly with respect to the method of cultivating rice, millet, and Guinea pepper. Their king, called "taba," "taba seyle," or "taba seil," exercises despotic authority over his subjects, and never appears abroad without the utmost pomp and magnificence; and he receives from the people a degree of veneration and awe, which belongs to superior beings. They are said to be believers in a future state, which appears by the ceremonies performed to the souls of the deceased, and the prayers they offer for a happy meeting in another world. They welcome the new moon with songs, dancing, and every kind of diversion; and their superstitious regard for forceers is extreme.

The sole employment of many of the negroes, especially about the river Sestos, is fishing, which they perform in their canoes, by a land-line and hook. The artists of Sestos

are also peculiarly expert in their manufacture of iron and metals.

The Portuguese possessed for many years an independent and uncontroled connection with this country; but in the year 1664 the English and Dutch, perceiving the advantages which were derived from their commerce, interfered, and their rivals prevailed to such a degree as to drive the Portuguese settlers into the interior parts of the country, where they united themselves with the natives; and from this intercourse sprung that mixed progeny of Mulattos, who are more numerous here than in any part of Guinea. The small remnant of trade now possessed by the Portuguese is entrusted with these persons, to whom they give the appellation of the *hidalgos* or gentlemen, having protelyted them to their forms of Christian faith and practice, and initiated some of them into holy orders, whom they employ in propagating their notions of Christianity.

The months most favourable to trade on this coast are February, March, and April; small vessels, which are capable of sailing up the rivers into the country, are more convenient than large ships; and it should be recollected, that the S.S.E. winds begin to blow in the month of May, and they bring with them heavy rains and tornadoes, with terrible thunder and lightning, extremely dangerous to shipping.

GRAINE, an island in the mouth of the river Thames, about  $3\frac{1}{2}$  miles long, and  $2\frac{1}{2}$  broad, separated from the coast of Kent by a narrow channel, called the "Stray," or "Yenlade." It is low, flat, and marshy, and has upon it only a number of detached huts, with some salt works. N. lat.  $51^{\circ} 2'$ . E. long.  $0^{\circ} 42'$ .

GRAINED MEDALS. See MEDAL.

Cross GRAINED Stuff. See CROSS GRAINED.

GRAINGER, JAMES, in *Biography*, a physician and poet, was born at Dunfer, a small town in the south of Scotland, about the year 1723. After finishing his school education, he was sent to Edinburgh, where he commenced his medical studies under professors who were highly celebrated through the medical world, and in due time he received his degree of M. D. He commenced his professional career as surgeon in the army, and in that capacity he served in Germany, under the earl of Stair, till the peace of Aix-la-Chapelle, in 1748. He afterwards settled in London, and practised as a physician. He here obtained and cultivated the friendship of several distinguished literary men, particularly of Shenstone and Dr. Percy, afterwards bishop of Dromore. While in London he published his translation of the elegies of Tibullus; but this work did not receive the approbation to which he thought it entitled, especially from Dr. Smollet, whose criticisms were the occasion of a long paper-war between them, and produced an irreconcilable difference. Probably his success in practice in London was not great, as he embraced an offer of settling advantageously in the island of St. Christopher, in the West Indies; where, by marriage, he became connected with several of the principal families, and practised his profession with great success. He continued, however, to cultivate his attachment to the muses, and wrote, during his leisure hours, an interesting poem "On the Culture of the Sugar Cane." He likewise composed a treatise "On the Diseases of the West Indies," for the use of the planters. At the conclusion of the war, he paid a visit to his native country, and at the same time published his poem, with copious notes relative to the natural history of the island. He afterward returned to St. Christopher's, and continued to practise till the beginning of the year 1767, when he was seized with a fever, which then raged in the island, and

died. Dr. Grainger was benevolent in his disposition, engaging in his manners, and an able physician: he ranks also considerably above mediocrity as a poet. An "Ode to Solitude," and "A West Indian Ballad," (the latter published in Dr. Percy's collection) have been much admired. He published several medical tracts. Hutchinson. Biog. Med.

GRAINGER, in *Geography*, a county of America, in the district of Hamilton, Tennessee, formed of parts of the counties of Knox, Jefferson, and Hawkins, and bounded N. by Virginia and Kentucky. Its chief town is Rutledge. It is very mountainous, interspersed with fertile valleys. It contains 7367 inhabitants, of whom 496 are slaves.

GRAINING, in *Ichthyology*, the name of a fish found in the Mersey, near Warrington; it resembles the dace, but is more slender, and has a straighter back. See DACE.

GRAINING Board is a board used by the curriers, to give the grain to their leather.

It is made with teeth, or notches, running quite across; into which the soft, moistened, suppled leather being pressed, its surface readily takes the impression. See CURRYING.

GRAINVILLE, in *Geography*, a town of France, in the department of the Eure, and chief place of a canton, in the district of Les Andelys. The place contains 393, and the canton 10,846 inhabitants, on a territory of 185 kilometres, in 32 communes.

GRACLE, in *Ornithology*. See GRACULA and PARADISEA.

GRACILLÉ, the fourth order of birds, comprising those which have the bill cylindrical, and a little obtuse; tongue entire and fleshy; and the legs naked above the knees.

GRALLATORIÆ. See CLASSIFICATION.

GRAMAT, in *Geography*, a town of France, in the department of the Lot, and chief place of a canton, in the district of Gourdon; 22 miles N.N.E. of Cahors. N. lat.  $44^{\circ} 47'$ . E. long.  $1^{\circ} 49'$ . The place contains 1842, and the canton 9888 inhabitants, on a territory of 275 kilometres, in nine communes.

GRAMAYE, JOHN BAPTIST, in *Biography*, a writer of history, was a native of Antwerp, and flourished in the early part of the 17th century. He studied at Louvain, and became professor of rhetoric in that university. He was afterwards historiographer to the Low Countries, and obtained some other offices of trust and honour. He travelled through the greater parts of Germany and Italy, and proceeding from the latter country to Spain, he was made captive by an Algerine corsair and carried to Africa. How he obtained his release does not appear, but his writings prove that he had been an attentive observer of that country. Upon his return to his native land, he travelled into Moravia and Silesia, and in the latter province he was, by cardinal Dietrichstein, placed at the head of a college. He died at Lubec in 1635, leaving behind him many works, which shew that he was unquestionably a man of great learning. He wrote in prose and also in verse. Of the former are "Africa Illustrata, lib. x." 4to. 1622: "Diarium Algericense;" "Peregrinatio Belgica;" "Antiquitates Flandria;" and "Historia Namurcensis." The first of this list of works contains a history of Africa from the remotest periods to his own times, with geographical details; and the second is the result of local observation during his captivity. Moreri.

GRAMEN, in *Botany*. See GRAMINA.

GRAMEN Murorum, *âficatongiffima*. See FESTUCA.

GRAMINA, Grasses, a most natural order of plants, the fourth of Linnaeus, and the fourth order of the second class in the Genera Plantarum of Jusseu, who chooses to alter

alter the appellation of it to *Gramineæ*. The Latin word *gramen* is supposed to be derived from *gradens*, going or proceeding along, in allusion to the great increase of many of these plants by their creeping roots.

Jussieu's second class consists of monocotyledonous plants with a superior germen. His definition of the present order is as follows.

*Calyx*, (which he terms *glume*;) single or many-flowered, enclosing, in the latter instance, two or more flowers, disposed in two ranks in a little spike or ear; it is mostly of two valves, rarely of one or of many, or altogether wanting. Each flower has a *corolla*, (called *calyx* by Jussieu,) resembling the before-mentioned calyx, mostly of two valves, rarely of only one, or altogether wanting; the outer valve either beard-like or awned. *Stamens* below the germen, of a definite number, except in the *Pariana* of Aublet, generally three, rarely two, or six, or one; their anthers oblong, forked at each end. *Germen* one, superior, accompanied at the base by two little scales, not always evident. *Styls* often two, with two feathery stigmas; sometimes one, with a simple or divided stigma. *Seed* in either instance solitary, naked, or often clothed with the permanent inner valve of the corolla. *Embryo* small, attached below to the side of the farinaceous and much larger *albumen*. The lobe of the embryo in germination is permanent and sessile along with the annexed albumen, attached on one side, at the bottom, to the primary sheath which surrounds the plumula, or bud of the future plant.

The *roots* are fibrous and capillary. *Stems* or *culms* cylindrical, either hollow or filled with pith, jointed or separated into distinct portions by knots, mostly simple and herbaceous. *Leaves* alternate, generally solitary at each knot of the stem, sheathing, their sheath splitting down to the knot. *Flowers* either in dense clusters, or spiked upon a common *raceme*, or panicle, concealed before they arrive at maturity in the sheath of the upper leaf. Some species are monoicous, by an abortion of some of the organs.

Botanists have differed much about the principles on which the genera of Grasses should be founded. Linnæus and Jussieu take into consideration the number of flowers, or rather florets, in each calyx; Hüller in a great measure rejects this, paying regard chiefly to the figure of the parts, which indeed is of primary importance. He does not, however, sufficiently attend to other equally important marks, as the distinction, for instance, between *Poa* and *Briosa*, consisting in the incorporation of the seed of the latter with the larger valve of the corolla, and its depressed figure. It were to be wished that the awns of grasses were permanent and constant in the same genus, or at least species, but though constant in some, as *Arvum*, in others, as *Agrallis* and *Triticum*, they are not sufficient to discriminate species.

In the sexual system Grasses chiefly belong to *Triandria Digynia*. Some few have proper monoecious, none dioecious flowers, and several are polygamous, having a few male blossoms intermixed with perfect ones furnished with both stamens and pistils, and were therefore referred by Linnæus to *Polygamia*. But this latter circumstance is so common and variable, and causes such unnatural separations of species or genera, that botanists have generally agreed to pay no regard to it in this family, but to class all such grasses by their perfect flowers.

Linnæus remarks that "Grasses are the most general of plants, constituting almost a sixth part of all the vegetables on our globe, especially in open situations. There they multiply, and extend themselves by creeping roots, to a vast extent. In confined and woody places they scarcely creep, but grow erect. They are the most important of plants,

especially as affording the chief sustenance of mankind, and feed on vegetables. They furnish the verdure of our pastures, and spread a carpet over our meadows. Their leaves are not easily damaged, even by our walking over them, and though winter destroys their foliage, and the creeping finds them dry and withered, they rise in a wonderful manner from apparent death. How sensibly has the Author of Nature protected these plants, by giving them such hard stems, while they are perishing to be seen, that cattle cannot readily attack them in that state! They, on the other hand, they are so constituted, that the more their herbage is cropped, or hardly used, the better they thrive, and extend themselves the more under ground. That they may be able to exist in almost every situation, their narrow spiny leaves are purposely contrived to insinuate themselves between other plants.

"The creeping roots of grasses are formed like a tapeworm; and are mostly fibrous, rarely tuberos or bulbous. They consist of numerous joints and knots, each of which has its bud, capable of producing a new stem, and therefore they are separated by the heavy tread of cattle, the more they multiply, thus constituting the strength of the vegetable kingdom.

"Very few grasses have any peculiar taste, most of them having the insipidity of pot-herbs, though some few are fragrant, at least when dry. None are dangerous or poisonous, if we except the intoxicating seeds of *Lolium temulentum*. They are the most simply constructed of all herbs, scarcely any of them having thorns, prickles, tendrils, stings, bristles, or other appendages. Their stems are with us generally simple; in India frequently branched. Leaves always single and undivided, mostly quite flat, and if one side be somewhat rounded, it is never that next the stem. The sheath of their leaves is often crowned with a membranous stipula, called by some *ligula*, which closely embraces the stem as growing, to keep out water.

"The fructification of Grasses is so different from other plants that it was judged impossible to reduce them to order. They were first divided into Corn and Grasses, but the former differ from the latter merely in the greater size of their seeds, which compose the basis of our aliment, as the smallest of the grass-seeds nourish small birds. Ray first examined this tribe scientifically, dividing them by their habits or likenesses, but he traced out no just limits. Tournefort, though a most eminent botanist, was not equal to this subject. Monti followed Ray, but examined the grasses of Italy only. John Schenckzer, at the persuasion of Sherard, undertook ample and minute descriptions of every grass he could procure, but the herbage of all is so similar, that his descriptions, till he comes to the inflorescence, are too little contrasted. They are, however, very exact. Micheli first contrived a method of arrangement founded on the spikelets being simple or compound, with an attention also to the sexual parts; but he subjected some plants, termed *graminifera affines*, which have really no connection with them. If the sexes of grasses be attended to, their arrangement becomes less difficult. Their inflorescence is either spiked or panicled."

The principal writers on Grasses, besides those above-mentioned, are Schreber, who wrote in German, with fine plates, coloured or uncoloured, and who is very full on their qualities and uses; Rottböll, who described new or rare species, with plates; Linnæus the younger, in a thesis describing new genera of grasses; Hoff, who has published three folio volumes, with excellent coloured plates in the style of Jacquin, entitled *Gramina Austriaca*; Leers, who in his *Flores Herbæneis* has delineated and engraved all the grasses

grasses of that Flora, with more exquisite precision than can be found in any similar performance. Stillingsfleet, Curtis, and Swayne have in England published botanical and economical remarks on grasses, the latter giving dried specimens to illustrate them. Many species are admirably represented and described in the *Flora Londinensis*, and the second part of the first volume of the *Flora Græca* contains 50 plates of rare and curious grasses, from the drawings of Mr. Ferdinand Bauer, which are among the most beautiful and perfect of their kind.

The number of genera of grasses in Jussieu are 60, arranged in 13 sections, nine of which comprehend grasses with two styles, four those with only one. This distinction however is not one of the most absolute, even in the same genus. His subdivisions are marked by the number of stamens, or of florets, according to what we have mentioned above.

Willdenow has in his *Triandria Digynia* 34 genera, besides five in *Triandria Monogynia*, *Cinna* in *Monandria*, and *Nardus* in *Diandria*; he has moreover, in *Hexandria*, *Ehrharta*, and *Oryza*, in all 43. He has five genera in *Monocœcia*, making 48 in the whole, besides the polygamous ones, which after the original plan of Linnæus, he refers to *Polygamia*. We have not yet seen this latter part of his work. In the 14th edition of Linnæus's *Systema Vegetabilium* the genera of polygamous grasses are eight, only, *Holcus*, *Cenchrus*, *Ispemum*, *Manisuris*, *Ægilops*, *Spinifex*, *Anthropogon*, and *Apluda*. Willdenow places *Cenchrus* in *Triandria Monogynia*, we believe with great propriety, but the genus appears unnatural with respect to habit, and perhaps requires to be new modelled.

Mr. R. Brown, in his *Prodromus Floræ Novæ Hollandiæ et Insulæ Van-Diemen*, has defined 35 new genera of this natural order; *Sporobolus* separated from the Linnæan *Agrostis*; *Polyopogon* of Desfontaines; *Pentopogon* of Billardiere; *Streptachne* very near *Stipa*; *Amphipogon* remarkable for having an awn to each of the five segments of its corolla; *Diplopogon* apparently too nearly akin to the last; *Anisopogon* very near the following; *Danthonia* of Decandolle; *Glyceria* of which we have treated in its proper place; *Triodia* very near *Poa*; *Eriachne* somewhat akin to *Aira*; *Triraphis*; *Eleosia*; *Eleusine* of Gärtner; *Chloris* of Swartz; *Calaçhne* remarkable for having its imperfect flower female, not, as usual in grasses, male; *Chamaraphis* distinguished from *Panicum* chiefly by the peculiarity of three styles; *Orthopogon* formed of Linnæus's *Panicum compositum* and others; *Pennisetum* of Richard; *Neurachne* resembling an *Alopecurus*; *Isachne* to which belongs the *Meneritana* of Herman's Zeyl. 24; *Xerachne* whose seed is inclosed in the inner paper-like valve of the corolla; *Thuarea* of Thuars in Perfoon's Synoplis; *Imprata* of Cyrilli, which is *Lagurus cylindricus* of Linnæus; *Dimeria* near *Saccharum*; *Ophiurus*; *Lepturus*; and *Hemarthria*; the three last separated from *Rottbøllia*; *Microchloa* which is *Nardus indica* of Linnæus; *Zoysia* recently formed by Willdenow of his *Agrostis Matrella*; *Hierachne* of Gmelin Sibir. which is *Dicerenum* of Billardiere; *Tetrarrhena* composed of the *Ehrharta distichophylla* of Billardiere with other species; *Microlena* his *E. stipoides*; *Potamoiphila* a water grass near *Oryza* and *Zizania*; and finally *Leptaspis* which has the aspect of *Pharus latifolius*.—It is not wonderful that a country whose natural productions are all so very anomalous with respect to those of the rest of the world, should afford so many novelties, even in so natural and well-known a family as the grasses.

GRAMINEA, in *Antiquity*, is applied to a crown formed of grass, *gramen*, bestowed by the Romans on certain of their generals, in consideration of their having saved or rescued an army.

The grassy crown, *corona graminea*, was but rarely conferred, and for some signal exploit; when, through the courage or dexterity of a general, an army reduced to the last extremities had been saved, or delivered, and the enemy put to flight.

GRAMINEOUS HERBS, among *Botanists*, are such as have a long, narrow leaf, with no foot-stalk.

\* GRAMINIFOLIA, a name given by Dillenius to a genus of plants, called by Micheli and Linnæus *zannichellia*.

GRAMMAR, teaches the right use of language, or to speak, to read, and to write a language with propriety. Particular grammar teaches the principles peculiar to any one language. Thus the English grammar ascertains and teaches the principles which exclusively belong to, and which distinguish the English tongue. The French grammar professes the same end with regard to the French; and this is the case with the grammar of any other language.

When grammar is limited to any particular language, it is employed in its humblest province, and may be considered only as a mere *mechanical art*, the rules of which are little investigated, and have no other foundation than the practice of those who speak and write that language. But when grammar, rising above the consideration of any one language, compares many languages together, and by this comparison traces the principles which are common to them, unfolding by that means the nature and origin of speech, the causes by which it is divided into distinct dialects, and the analogies which facilitated the growth and determined the idioms of each: grammar, in this extensive view, assumes the nature of a *science*, and is justly distinguished by the name of *general* or *universal grammar*.

That grammar claims the dignity of a science, in consequence of investigating the general principles of speech, is evident from the slightest consideration. All languages, however different, have many properties in common. They have in general the same parts of speech, because the ideas or things which they express exist with little or no variation in the nature of things. Men also, in all ages and countries, have the same organs of speech, which are similar in structure, however modified by peculiarities of enunciation. Finally, the same great law of association regulates the mind of every man; and the political, moral, and religious institutions, which direct the operations of this law, however remote in age and country, considerably resemble each other. To these causes it is owing, that the languages of all nations, ancient and modern, are marked by a similitude truly surprising; and the more closely they are examined, the more numerous will appear the points in which they all resemble each other. Hence may be justified the conclusion, that as all the tribes of men originated in one family, so all the languages of men are but ramifications of one original tongue.

Grammar has usually been divided into four departments, namely, *orthography*, *etymology*, *syntax*, and *prosody*. Orthography teaches to form and to sound letters, to analyse or combine syllables, or to express words by their proper letters. Etymology comprehends the classification, the properties, or, more properly speaking, the derivation and composition of words. Syntax prescribes the government or the right order of words in a sentence; while prosody directs the just pronunciation, the poetical construction of words, or supplies the laws of versification. But this distribution of the parts of grammar is neither useful nor accurate, as they are not independent of each other. Etymology is a principle necessary to account for phenomena in every department, and is that upon which orthography is chiefly founded. We therefore discard these divisions of grammar, and distribute and confine our observations on this subject



to the origin, nature, classification, and the properties of words.

*The Origin, Nature, and Classification of Words.*

Words have been defined articulate or significant sounds, formed by the organs of speech, and used by common consent as signs of ideas. The propriety of this definition will appear, if we attend to the mode in which words acquire their signification. The best method to teach a language, with which a youth is yet entirely unacquainted, would, if attended to, clearly unfold the nature and origin of speech in general. Suppose a *book* is held out before him for the first time, an *impression, phantasia, or id* of that object is thus conveyed to his mind by the organ of sight. While this impression continues, suppose farther that the *sound* book is distinctly uttered; he will then have an impression or idea of the sound conveyed through the sense of hearing, which will be rendered more distinct, if he himself be taught to enunciate it. The two ideas, namely, that of the *object*, and that of the *sound* will then, if long continued, or often repeated, coalesce in his mind, and become so illogically connected, that the idea of the object shall suggest that of the sound, book: and, on the other hand, the sound shall recal the object. The principle on which this coalition is founded, is a law of the human mind, known under the name *association of ideas*; and the progress of the learner in connecting other ideas with other sounds, is only a repetition of the operation, till the whole language is acquired.

From this brief description, naturally follow a few inferences of importance, to be observed on this subject. *First*, sounds, though so closely connected by frequent use with the things signified, as not to be separated from them even in imagination, have no natural affinity with them. Any other sound than *book, moon* for instance, might have been associated with that object in the mind of a learner, and this last name would as naturally, by use, be applied to book, as we now apply it to the object so known in the sky. And this is the reason why the same idea is expressed by different sounds in different countries, where each sound is rendered equally natural and familiar by repeated associations. *Secondly*, as language altogether depends on an arbitrary compact between sound and sense, there exist not, in any regular polished tongue, such words as *natural* articulate sounds. There are, indeed, in all languages, certain sounds indicating desire or aversion, pleasure or pain, but these are natural cries, and not articulate sounds; and they arise more from the structure of man as an animal, than from his rank as an intelligent being, capable of forming distinct ideas, and expressing them by articulate sounds. Hence such sounds are common to him with inferior animals, and abound most among men in the savage state, where language is least formed. The above explanation farther excludes what have been called *fictitious* words, or words whose sound bears some resemblance to the sense. Some words indeed, of this kind, are supposed to exist in all languages; but the supposition, we venture to affirm, is erroneous, the imagined similarity being altogether the effect of association. This principle, when a word is heard, instantly suggests its meaning, and while we overlook the suggestion, we ascribe the sense to a fancied similitude between it and the sound. Let an idea be in your mind, when you hear a *cock* *crow*, or a *bell* *toll*, and you will immediately suppose, that the sound of the cock, or of the bell, conveyed the entertained idea. This is a delusion precisely similar to that into which we fall respecting the import of fictitious words. If there be any word in our language, or in any language naturally indicative of the sense, it is

*cuckoo*; and yet ask a foreigner, although unacquainted with English, what the term means, and he will not be long misled. From the sound, to ascertain the object, is not a word is a repetition of *coo coo*, which exists in Greek under the form of *κοο*, and which in Persian signifies the sound made by a strong emission of the breath. Hence the Persians express the *owl* kind by *caa*, which we have borrowed and confined to the female *cow*, which originally meant a *loving* animal. In Chaldæe, *caak*, means a *magpie*, the sound of whose voice is very different from that of the cuckoo. We cannot help remarking, that if a similitude between sound and sense obtained in any part of language, it would appear more manifest and predominant in the most ancient languages, and especially in Hebrew, which we conceive by far the most ancient, even of the Asiatic tongue. But we venture to affirm, that not a single instance of the kind can be produced in that tongue. And this early specimen of human language is a fair presumption, that the principle of fictitious sounds did not in the least obtain in the first formation of speech.

From the above explanation we infer, in the *third* place, that the names of things, at first, were names of *individual* objects, and that man learnt in youth, to form *general* ideas, *solely by means of language*. Thus with respect to the above-mentioned youth, when he has connected the sound book with the thing so called, the word is only a sign of the individual book which was first presented to him. Presently, however, he perceives the same sound applied successively to other objects of the same kind; and this application leads, and in a manner *compels* him to note those peculiar circumstances which distinguish each book, and those, on the other hand, which belong to that whole class of objects. As the sound is not repeatedly associated with the former, he *forgets*, and consequently *overlooks* them; while he combines the ideas belonging to the class, and retains them in a closer and yet closer union, under the term which was his instrument in forming those ideas. In this manner are all our *abstract* ideas acquired; and language, as the mind rises by means of it, from the contemplation of one to many objects, from individuals to classes, is the sole instrument in acquiring them. Some indistinct idea of this process was probably the circumstance which led our celebrated grammarian, Mr. H. Tooke, to say, (vol. i. p. 36.) "That the composition of ideas was merely a contrivance of language; that the only composition was in the *terms*, and that they are not ideas, but merely terms which are general and abstract." In another place, he denies the operations of the mind as influencing speech, and talks of the operation of language. These, and such other remarks are, however, so palpably erroneous, that we cannot ascribe it to ignorance or inattention in so enlightened a critic, but suppose them to have proceeded chiefly from a desire which pervades his works, of rejecting the ideas of others as unjust, because they were *known*, and conspicuously displaying his own as right, because they were *new*. The composition of terms in grammar, is merely the derivation or combination of terms; by such laws as custom or analogy have previously determined. Composition of this kind, with which a grammarian, as such, has any thing to do, is as distinct from the composition of ideas, as sound is from sense, or grammar is from logic. Language has no power but what it has derived from *association*; and he who speaks of the operation of language, instead of the operation of the mind, acts the absurd part of a man who ascribes to the pen, the direction of the hand which directs it. If we can judge from his works, Mr. Tooke appears not to have studied the true theory of the human

mind; and from the want of just ideas on this subject, he has, as we shall shew in the sequel, plunged himself and his readers in deep and manifold errors.

As general or abstract ideas, which are the chief materials of science, are formed solely by the instrumentality of language, we may hence see the reason why the study of language ought to form the *basis* in every system of education; and why science can flourish only among a people previously acquainted with the arts of eloquence and composition. The philosophy of grammar, moreover, as it retraces the track of the human mind, in the formation of its ideas, through the medium of speech, is the best guide to the knowledge of its powers and operations, and consequently to their proper direction. Hence the only systems of metaphysics and logic, worthy the attention of a philosophical enquirer, are those which are built on the foundation of grammatical analysis.

But further, as words in the very commencement of every man's education denote individual objects, and become signs of classes or kinds by the successive application of each word to many individuals of that class, we might conclude that in the original language of mankind, if solely the effect of human invention, each term at first was but a proper name of a thing or of a quality, and afterwards represented a greater number of individuals as the mind advanced in the principle of generalization. But this inference is contrary to the fact. The Hebrew tongue carries us back almost to the infancy of human society, and, whether it be the original language of mankind or not, it presents us with much fairer specimens of what language must have been, than we can gather from any modern dialect. The primitive words of that language are founded upon the most comprehensive analogies; and the learner, in acquiring that tongue, instead of being carried up from the individual to the species, and from the species to the genus, finds himself on the top of the most extensive class; and in the formation of words he is made to descend from general to specific terms, and from specific terms to proper names; so that all the proper names which we meet with in the Hebrew records are really derived from general appellations. This phenomenon appears to us completely to annihilate the supposition, that language is solely the fruit of human ingenuity. Moses, in his history, obliquely states, and, with his usual brevity, accounts for the fact: "And out of the ground the Lord God formed every beast of the field, and every fowl of the air, and brought them to see what he would call them: and whatsoever Adam called every living creature, that was the name thereof." The Arabic translation, we apprehend, alone places this verse in its proper light, by rendering *to see*, to cause *to see*, i. e. *to shew*. The author then intimates that God shewed or directed Adam in the application of names to things. And what can be more probable, than that *He*, who formed the organs of man, should at first instruct man in the proper use of them.

Lastly, it follows from the above explanation, that words, as they are at first associated with ideas, are in strict propriety signs of *ideas*, and not signs of *things*. For unless the idea be previously in the mind, there can be no union by association of sense with sound. The association takes place in the mind, and where the idea of the thing, and that of the sound do not meet, there can be no formation of articulate sound. The learner, however, is not sensible of any distinction between his ideas and the external objects which are their origin or prototypes; and he refers the sound immediately to its prototype, without being conscious that an impression or idea of it exists in his mind. As, however, we know nothing of things but through the medium of our ideas, and as ideas must depend for their properties and distinction upon the

things they represent, the above oversight is not productive of any error or inconvenience; and we may say that words are signs of things, or of the ideas of things, without any prejudice to philosophical accuracy. This leads us to the classification of speech, or its division into parts.

The common distribution in our own tongue is into *nouns, articles, adjectives, pronouns, verbs, participles, adverbs, prepositions, conjunctions, and interjections*. This division has obtained with little variation in other modern languages, and has been derived, on the authority of ancient grammarians, from the languages of Greece and Rome. The above classification, however general and convenient in a popular view, is by no means to be admitted in a philosophical grammar. And the few writers of this kind in English, or other tongues, have been sensible of the inaccuracy of the popular division. The Oriental grammarians admit only *three parts* of speech, the verb, the noun, and particles derived from these. Plato, whose notion of language as a science must have been formed in Egypt, mentions only two, the noun and the verb; tom. i. p. 261 Edit. Ser. And Aristotle mentions no more, where he treats of propositions. (De Inter. c. 2.) But Mr. Harris, Herm. p. 38. thinks that those philosophers were not ignorant of the other parts of speech, but spoke with reference to logic or dialectics, considering the essence of speech as contained in these two, because they alone combined to make a perfect affirmative sentence, which none of the rest without them are able to effect. But Aristotle, in his treatise of Poetry, where he was to lay down the elements of a more variegated speech, adds the *article* and *conjunction* to the noun and verb. The latter Stoics, improving on the authority of Aristotle, instead of *four parts*, made *five*, by dividing the noun into the *appellative* and *proper*. Others increased the number, by detaching the *pronoun* from the *noun*; the *participle* and *adverb* from the verb; and the *preposition* from the conjunction. The Latin grammarians went farther, and detached the interjection from the adverb, within which by the Greeks it was always included as a species.

Mr. Harris, following Aristotle and the elder Stoics, divides speech into words that are significant as *principals*, and those which are significant as *accessories*, including under the former class *substantives* and *attributives*, and under the latter *definitives* and *connectives*. This distribution is set aside and ridiculed by Mr. Tooke, who says, vol. i. p. 47; "In English, and in all languages, there are only two sorts of words, which are necessary for the communication of our thoughts, and they are noun and verb. And as to the parts of speech, they may be either *two* or *twenty*, or more. In the strict sense of the term, both the necessary words and the abbreviations are all of them parts of speech; because they are all useful in language, and each has a different manner of signification. But I think it of great consequence, both to knowledge and to languages, to keep the words employed for the different purposes of speech as distinct as possible. And therefore I am inclined to allow that rank only to *necessary* words: and to include all the others, which are not necessary to speech, but merely *substitutes* of the first sort, under the title of *abbreviations*." In this boasted division, as we shall presently see, there is neither utility nor accuracy, and the author was betrayed to it by a secret wish to place the novelty of his own system in the most conspicuous light, namely, that conjunctions and prepositions are but abbreviations of nouns and verbs.

Now it is singular, that the division which we think the most philosophical, and, therefore, the most simple and useful, is that which is thus proscribed in a very laboured

treatise on grammar, in the Encyclopædia Britannica, (article 11.) "The division of words into those which are *significant of themselves*, and those which are *significant by relation*, is absolute nonsense, and has been productive of much error and mystery in some of the most celebrated treatises on grammar. It is indeed probable, that any attempt to establish a different classification of the parts of speech, from that which is commonly received, will be found of little utility, either in *practice* or in *speculation*. As far as the *former* is concerned, the vulgar division seems sufficiently commodious; for every man who knows any thing, knows when he uses a noun, and when a verb. With respect to the *latter*, not to mention that all the grammarians, from Aristotle to Horne Tooke, have differed on the subject; it should seem to be of more importance, after having ascertained, with precision, the nature of each species of words, to determine in what circumstances they differ than in what they agree."

If these remarks be just, any attempt at a philosophical arrangement of the parts of language must be frivolous and useless. But we regard the paragraph as a manifest acknowledgment that the writer knew of no such arrangement, and that, as is often the case, he endeavours to console himself and his readers, under the absence of this knowledge, with the consideration that if attained it would not be useful. We shall, however, attempt briefly to do what he thinks unnecessary to be done: but what we think not only useful and necessary, but even essential, in a philosophical treatise. An accurate distribution of our words, is but an accurate distribution of our ideas; and as in logic we cannot think justly, unless we know how to distinguish our thoughts; so we cannot with precision reason in grammar, unless we have previously distinguished the parts of speech. The source of this distinction must be sought in the nature of the ideas expressed by those parts, and the enquiry, how many sorts of words there exist in human language, is merely, when directed to its proper object, how many sorts of ideas there are in human knowledge.

We have then ideas of *things*: we have ideas of the *properties* or *attributes* of things: we have ideas of the *connection* of things, *i. e.* of the arrangement of things, or of their increase or diminution: finally, we have ideas of the *relation* of things. Nor have we an idea which may not rank with one of these classes. And as language consists of terms expressing ideas, it consists of terms which express either ideas of *things* or the *attributes* of things, or the *connection* of things, or the *relation* of things. The terms expressing things are *nouns*, including substantives and the personal pronouns, which are only *substitutes* for nouns, and therefore, in their nature, names of things. *Sweet* is an attribute of sugar, and so is *to think* an attribute of a man; *to fly* of a bird; *to be* of a being that exists, and so, moreover, *loving*, *hating*, are attributes of some creatures susceptible of love and hatred; finally, the circumstances which define things or distinguish them from others, may be considered as attributes or properties of the things so defined. The terms expressing attributes may be called *attributives*; and include adjectives, verbs, adverbs, participles, and definitives. The terms expressing the relations of things are prepositions; while those which express the connection of things are conjunctions. And thus the most comprehensive, and, as we conceive, the most philosophical division of speech is into four parts, *nouns*, *attributives*, *prepositions*, and *conjunctions* or *connectives*; nor is there any language, however few or numerous its terms may be, which is not capable of being distributed into these four classes. As to the *interjection*, it must be regarded as a sound which is either inar-

ticulate, or which, as far as it partakes of articulation, partakes of the nature of a noun or of a verb. Having noted this distribution, we, as not systematically writing on grammar, shall, in our remarks, follow the popular division.

Nouns and attributives, to use Mr. Harris's language, are significant as *principals*, and we do not depart from philosophical accuracy, when we say that prepositions and connectives are significant by *relation*. Our notions of the relations and connections of things arise by the principle of abstraction from our notions of the things themselves to related or connected. If all ideas of things or actions were obliterated from our minds, the ideas of their associated relations would be entirely obliterated with them. And as our notions of relation spring from the objects so related, so language, following the rise and progress of ideas, has derived those terms which express relations and connections, from the terms expressing the things and operations so related and connected. In other word, prepositions and conjunctions are words which, by association, flowed from nouns and verbs as their real sources. If this be correct, what shall we say to Mr. H. Tooke, who affirms prepositions, conjunctions, and other particles, to be substitutes for those necessary words, the noun and verb. If this assertion be put in clear language, it means that the relations of things, or of the operations of things, are *substitutes* for the things so related; that is, the relation of *cause* and *effect* is a substitute for cause and effect; the relation of *beginning* is a substitute for things which begin; the relation of *instrumentality* is a substitute for that which is instrumental; and the relation of *end* is a substitute for that which ends. Moreover, the separation or concatenation of two or more assertions is a substitute for the operations so separated or connected. This is not philosophical reasoning, calculated to throw light on language, but a sophistry calculated to confound the most distinct ideas which the human mind is capable of forming, and a jargon not to be equalled by any error or contradiction, which Mr. Tooke has so severely censured and ridiculed in Mr. Harris. Besides, terms to express the relations and connections of things are not less necessary than those which denote things and their operations. A language without conjunctions and prepositions is not merely a sledge, (to use his own words,) which cannot be drawn along as smoothly, and easily, and swiftly, as a carriage with wheels, but is a sledge which has nothing to connect it with the horse; nothing to direct it in the way along which it should be dragged. The noun and the verb indeed may express a complete proposition; but the instances in which such simple propositions occur are very few, compared with those more complicated cases where the use of prepositions and connectives is absolutely necessary. The distribution of speech into necessary words and abbreviations, is therefore, in this point of view, also frivolous and erroneous.

#### *The Origin and Properties of Nouns.*

Nouns are the names of things, or signs of those ideas by which we come to the knowledge of things. The term is a corruption of *nomen*, which is from *nomos*, while *name* came probably from the Persian *nam*, which seems to be of the same origin with the Greek word. Nouns may be divided into three classes: names of *individuals*, names of *species* or *kinds*, names of *abstract ideas*. To this may be added, as a fourth class, the *pronouns*, which is made the substitute or representative of all other nouns. But we shall consider this in the place usually assigned to it by grammarians. On each of the above classes we beg to make a few brief remarks

Names of individuals do not enter into the composition of language; because individual objects are too numerous to have each a distinct name; and because language would then be changing in endless succession, each term dying away with the object it signified, and another rising to occupy its place. This is the reason why *proper names* cannot be translated from one tongue to another, the individuals specified by them, being confined to one time and one place, are not capable of being the prototypes of words in other times and places. Individuals, however, among men, animals, and places, which the purposes of life render it necessary to specify, have appropriate names given them to distinguish them from all other individuals. And it sometimes happens that when individuals among men become eminent for any attainment or profession, their names are used to designate others who are eminent in the same way. Thus proper names are sometimes converted into common names. The former are called proper, as being peculiar to individuals, in opposition to such names as are common to all the individuals of a class.

The perceptions of the human mind, as we have observed, commence with individual objects; but we are soon induced to compare those objects; and on comparing individuals together, we readily discern a resemblance between them in some things while they differ in others. The mind then separates the particulars in which objects *differ*, and collects into one idea their points of similitude. Thus it forms ideas of classes, or in logic called *species*, comprehending under them various individuals. After this the species themselves soon become subjects of comparison; and excluding from each its individual qualities, the human mind formed those more general aggregates termed *kinds*, comprehending under them different species, as the species comprehend different individuals. Thus mankind classified all the objects around them, and acquired specific and generic ideas in nature, in art, and in abstract qualities. Having, as it is supposed, first advanced in the classification of their ideas, men gave names to each class, and thus acquired those general terms which are called specific and generic terms. But we have already shewn that the process of the human mind, in the principle of abstraction, is the reverse of this: general terms do not arise, as will appear evident if we attend to the commencement of education in ourselves and others, from general ideas, but, on the contrary, general ideas arise from general terms. The former have no existence till they are generated in the mind solely by the instrumentality of language; the learner being involuntarily and passively led by the successive application of the same word to different individuals of the same class, to compare them, to separate their component parts where they differ, and to combine them where they agree. In this point of view, grammar is the foundation of logic; and language, instead of being the offspring of human invention, is the sole medium of awakening the first dawn of intelligence in the human mind, and points for its existence to some intelligence superior to man.

Specific and generic ideas being thus formed, the subject matter of language is reduced, so as to be commensurate with the limited faculties of man; because, though individual objects are infinite, the classes comprehending them are comparatively few. The subject matter of speech by this means, moreover, is rendered *permanent* and *universal*, or unconfined to points of space and time; because, though particular things, are local and transient, the species and kinds of things are universal and eternal. This is the reason why words which are unintelligible in one age and country are understood in other ages and countries; and

may be translated from one tongue into another, without ambiguity or error, where the prototypes exist in common. Farther, though general terms are often indefinite and uncertain, yet whenever they express species or kinds, they may be defined by ascertaining the several ideas which constitute those species or kinds. And as the properties which constitute each class are found complete in each individual of each class, the name of the kind is applied to each of the species; and the name of the species to each individual included under it: and thus generic and specific terms are employed by the assistance of certain adjuncts hereafter to be considered, to denote individuals.

General ideas may be considered as abstract ideas, as they are generated by the mind *separating* or *abstracting* from each object those particularities which constitute individuality. But they are to be distinguished, at least in a grammatical view, from that numerous and important class of ideas which we acquire by the more simple act of separating from a thing the quality which belongs to it. Thus, the attribute *to think* becomes *thought*; and *good* is converted into *goodness*. Abstract nouns of this kind are all, without exception, derived from *verbs* and *adjectives*, and formed by the simple power of withdrawing a property from the subject which supports it, and giving it an independent existence in the imagination. Now, it is a fact worthy of attention, that as general, so abstracted, ideas are formed by the sole agency of language, and would not have existed in the slightest degree, if words had not previously been applied to express the qualities of things. For as soon as a property was marked by an appropriate word, the separate and independent existence of that word, recognized by the eye or by the ear, induced the mind, without an effort and, perhaps imperceptibly, to give the property so designated an independent existence also. Mr. Tooke rejects the principle of abstraction, and would introduce in the room of it what he calls *subaudition*. Thus, according to him, *goodness* is that which is good: *flying* is that which flies: and under this erroneous and circuitous mode of explaining abstract qualities which he has borrowed from the neuter participle in Latin, he has attempted to bury out of sight the operation of the mind in forming abstract ideas. The existence of this operation, however, is too obvious to be denied with effect, and too important, in philosophical grammar, to be abandoned on the authority of any person whose acuteness of intellect may enable him sometimes rather to perplex than to unravel truth. In conformity to his own theory, Mr. Tooke supposes such words as *science*, *diligence*, which are abstract nouns, derived from the Latin *scientia*, *diligentia*, to be neuter participles plural in *entia*, a supposition contrary to the analogy of the Latin tongue, which affords not a single instance of plural adjectives being converted into abstract nouns.

We cannot help noticing in this place an observation in the *Encyclopædia Britannica*, 13; "As all the objects which exist must be either in the same state in which they were produced by nature, or changed from their original state by art, or abstracted from substances by the powers of imagination, and conceived by the mind, as having at least the capacity of being characterized by qualities; this naturally suggests a division of nouns into *natural*, as *man*, *vegetable*, *tree*, &c.; *artificial*, as *house*, *ship*, *watch*, &c.; and *abstract*, as *cobwebs*, *motion*, *temperance*, &c." This division has been borrowed from Mr. Harris, in his *Hermes*, and borrowed without consideration. Abstract ideas are the chief materials of science, which, giving birth to art, extended to the productions of art, as its genuine offspring, the use of its own terms. Accordingly, all *artificial* terms are abstract

abstract terms, or terms derived from adjectives and verbs. Thus, *stable* denotes an artificial production, and is at the same time an abstract noun from *stabilis*; and *plough* is taken from the Hebrew פָּלֶגֶשׁ, *phalag*, and means an instrument of separation. And even natural objects are often expressed by abstract nouns, as *creation* from the verb *create*. And if abstract nouns are extended by association to designate natural and artificial objects, they cannot with propriety be said to form a class of nouns distinct from nature and art.

Abstract nouns, expressing ideas properly so called, are very numerous in our language, and worthy of attention. They are chiefly taken from the Latin; as those in *tion* or *sion*, *ment*, *ence*, *ty*, or *tude*; as *faction*, *collusion*, *commandment*, *consequence*, *piety*, *altitude*. And all the nouns of this termination, with others in *nse* and *t*, such as *expansive*, *merit*, are also from this source. Many others are derived from the Anglo-Saxon or Gothic, such as all those in *ness*, *some*, and *hood*; as *goodness*, *noisome*, *neighbourhood*. The far greater part of Mr. Tooke's second volume is occupied in tracing nouns of this description. His etymological researches are, in many respects, useful and important; but we cannot help bearing our testimony against his work, as tending to direct the labours of philological enquirers to wrong objects, and to withdraw their attention from those sources, whence English and all other European languages, ancient and modern, have sprung. But let us hear his own words: "The bulk and foundation of the Latin language is Greek; but great part of the Latin is the language of our northern ancestors grafted upon the Greek. And to our northern language the etymologist must go, for that part of the Latin which the Greek will not furnish; and there, without any twiling or turning, or ridiculous forcing and torturing of words, he will easily and clearly find it. We want, therefore, the testimony of no historians to conclude that the founders of the Roman state and of the Latin tongue, came not from Asia, but from the north of Europe. For the language cannot lie. And from the language of every nation we may with certainty collect its origin. In the same manner, even though no history of the fact had remained; and though another Virgil, and another Dionysius, had again in verse and prose brought another Æneas from another Troy to settle modern Italy, after the destruction of the Roman government; yet, in spite of such false history, we should be able, from the modern language of the country, (which cannot possibly lie,) to conclude with certainty, that our northern ancestors had again made another successful irruption into Italy, and again grafted their own language upon the Latin, as before upon the Greek. For all the Italian which cannot be easily shewn to be Latin, can be easily shewn to be our northern language. Mr. Wakefield had, shortly before his death, agreed with me to undertake, in conjunction, a division and separation of the Latin tongue into two parts; placing together in one division all that could be clearly shewn to be of northern extraction." (Vol. ii. p. 140) In p. 209, he gives the following instances, with many others, of Latin words derived from the northern language:

Pinan,	<i>punire</i>	Suegian,	<i>fundere</i>
Pyngan,	<i>pingere</i>	Biddan,	<i>petere.</i>
Fegan,	<i>figere</i>		

According to Mr. Tooke, the words in Roman letters are plainly of northern origin, while those corresponding to them in italics are Latin verbs derived from them. The reverse of this position we can prove to be true. The Anglo-Saxon, or Gothic words, which this author dignifies as northern primitives grafted on the Latin, are not other than Latin words borrowed and corrupted by the northern barbarians when they over-ran the Roman empire. This position, if proved, will render the far greater part of Mr. Tooke's labours perfectly nugatory; and nothing more is necessary to prove it than to shew that the originals of the Latin words exist in Greek, or in one of the Oriental tongues, and exist too in such a form, as to evince that these are the primitives, and consequently that the northern words are only corruptions derived from thence. Thus the Hebrew קָפַח, *kaph*, is a hand; hence *aspicio*, to take in hand, and by softening *c* into an aspirate, as is often the case, *habeo*, to hold in the hand, *i. e.* to have. The Greek ἀναστροφή, overthrow, is the parent of the Latin *neo*, corrupted into *hæcæan*; ἀνα, I go, *eo*, *higan*; λαμβάνω, *lando*, *hentan*, to seize; ἄνω, ἄνω, *æceolopian*, to roll; ῥέω, *fluo*, *flæan*, to flow; σπύγγω, *spu*, and שָׂפָה, *spu*, signify lips; hence *spuo*, or *spuo*, the action of the lips in throwing out of the mouth, *i. e.* *spuo*, *spit*; μαλακίζω, to soften, *mulceo*, *milscian*; μολγίζω, *molgeo*, *molgian*, to milk; πῦμα, recompence, punishment, *punio*, *pinan*, to punish; πύγξω, a tail, *pingo*, *pyngan*, to act as a tail does, *i. e.* to prick; πύξω, *figo*, *figen*, to fix; ῥέω, *leo*, *delo*, to wash down, to obliterate by washing, *dilgian*; μύλλω, *molo*, Goth. *malan*, to mill; Chaldean מֹלֵךְ, *aro*, *zolo*, *aro*, *erian*, to plow; ῥέω, to rise, *tollo*, *tilian*; ἄνω, to spin, *twill*, *neho*, *gnitan*, or *nigan*; ἄνω, *tego*, or *tango*, *tekan*, to touch; δαμάω, *danno*, *deman*; ῥέω, *fool*, *prolo*, to taste food, *progan*, to prove; ῥέω, *transposing r*, as is often the case, *rapio*, *reafian*; ῥέω, to desire, *peto*, to seek in consequence of desiring, *biddan*.

Though this list clearly shews that the Northern language is, in a great degree, a corruption of the Latin borrowed from the Greek, the Hebrew, and other Oriental tongues, yet Mr. Tooke gives it as exhibiting instances of the Northern dialect grafted on the Latin. The primitive language of the North could have been no other than a branch of the primeval language of men, conveyed there by the first emigrants, diversified and enriched by communications with the East on the north of Asia, by early irruptions into Greece, as is mentioned by Herodotus, and, in far later days, by amalgating with the Latin, when in the dark ages the tribes of the North invaded and dismembered the Roman empire. In this state, the Northern language became the parent of the English; and though a multitude of its words, especially monosyllabic words, are, no doubt, immediately from the Anglo-Saxon and Gothic; yet few instances, we believe, can be produced, which may not be traced, by a competent etymologist, through the medium of those corrupt changes, to their primordial purity in Italy, in Greece, and in the East, the sole origin of language and literature. But Mr. Tooke reverses this natural and necessary order; and, without the testimony of historians, without any documents of the language subsisting in the North, antecedent to that which was spoken in the middle ages, he fixes on corruptions borrowed from the Latin, and holds them up as the originals whence Latin, Greek, and English have been derived. His theory, thus far, is ridiculous and mischievous; ridiculous, because it is a palpable error, professing important discoveries; and mischievous, because, while it pretends to trace words

Hæbian,	<i>habere</i>	Dilgian,	<i>delere</i>
Hæcæan,	<i>ncare</i>	Malan,	<i>molere</i>
Higan,	<i>ire</i>	Erian,	<i>arare</i>
Hentan,	<i>hendere</i>	Tillian,	<i>tolere</i>
Wealopian,	<i>volvere</i>	Gnitan,	} <i>ncere</i>
Fleuan,	<i>fluere</i>	Nigan,	
Spiran,	<i>spirare</i>	Kerfan,	<i>crefcere</i>
Speowian,	<i>spuere</i>	Tekan,	<i>tengere</i>
Spitan,	<i>sputare</i>	Deman,	<i>dammare</i>
Milscian,	<i>mulcere</i>	Profan,	<i>probare</i>
Meolgian,	<i>mulgere</i>	Reafian,	<i>rapere</i>

words to their genuine roots, stop up all the true sources of information on the subject of language. As we have passed this censure on his system, we feel ourselves called upon to justify it by more numerous instances. And we think this the more necessary, as subsequent grammarians, and the public in general, seem willing to acquiesce in his positions as incontrovertibly just.

In doing this we shall adopt the words which present themselves, without much selection, referring our readers to the page where they occur in his second volume. It was impossible to err as to the derivation of *right* from *rectum*; but *something ordered* is not the leading idea of the term, though Mr. Tooke employs many quarto pages in explaining it on this principle. The primary sense of *right* is *straight*, a relative term, denoting the means to an end. Thus, *virtue* is *right*, because it is the short or direct road to happiness. That hand is *right*, which does its work in the *shortest* way. Property is *right*, because it is the straight road to the welfare of society. In this sense we may say of God, if we say it with reverence, that it is *right* in him, because, when he has an end to answer, right means the straight way to accomplish it. "The *left-hand* is that which is *leaved*, or which we are taught to leave out of use on such occasion," p. 10. This appears to us nonsense. *Left* is the Greek *λεως*, and Latin *levus*, with *t*, the usual termination of northern words. *Lex*, Fr. *loi*, and our *law*, is from *lego*, and means something *read* or *dictated*, and not *something placed*, p. 8. The Anglo-Saxon, *leggan*, *ponere*, is but a corruption of *locare*, to place. *Iustus*, indeed, means something commanded, *justum*, from *jubeo*. But this last is the Hebrew *יָבֵן*, *gab*, and the Arabic *jaab*, to answer or assent. Hence, in Latin, *jubere legem*, to enact a law, *i. e.* to allow it to pass, and promise to obey it.

"*To cucol* is to do as the cuckow does," p. 21. Few people know how the cuckow does; but all know how a *cock* acts on such occasions. *Kokoraa* is an Eastern word, which, coming into Italy, gave birth to *cicurio*, to crow; and, changing *r* into the connate *l*, as is often the case, to *kokolaa*, which, in Celtic, is *kilog* and *kilogee*, to act as a cock does with a hen. This, we presume, is the origin of *cuckold*. *Hen-pecked* is a figure of the same nature, and from the same source. "*Alert* is *all-creeta*," p. 24. No, we presume it is *all-ert*, or *all-art*, *i. e.* all active. The word *art*, signifying skill, came to signify that diligence by which skill is attained. The opposite, which sanctions this etymology, is *inert*, not active. *Aknave*, *i. e.* a man cunningly skilful, came, by the same association, from *gnavus*, diligent. "*Laash*, (French *lâche*) of a whip, *i. e.* that part of it which is *let loose*," p. 32. Rather from *λυω*, an *ofer*. The French *lâche*, or the Italian *lasciare*, is the Latin *lassare*, from *λυω*, to bend. *To burn*, or *to burn*, gave birth to *brand*, *i. e.* a mark by burning;—*brandy*, *i. e.* spirits which burn;—*brown*, *i. e.* bread burnt;—*brunt*, brunt of the battle, *i. e.* the heat of the battle, or the place where the battle burns. The origin is *furnus*, an oven. *Odd* is not the participle *owed*, *i. e.* something owed to make up a pair, p. 38; but the Hebrew *אָבָד*, *abad*, one, single, singular, *i. e.* one that has no other to make an even number, or pair, with him. Thus we say, an *odd man*, *i. e.* a singular man. *Loud*, p. 39, is, we presume, from *λυω*, a voice heard. The Anglo-Saxon, derived from this word, has preserved the *x* aspirated, *blowan*. In Celtic it is *loed*, that which is heard in praise of a man. The Latin has rejected the guttural altogether in *laudo*. The Greek poets have applied the epithet *λυω* to such animals as *bleat*; hence *low*: *shred*, or *sherd*, *shur*, *shars*, (as plough share) p. 41, come from *κλιω*, to clip, by prefixing *s*, a

practice very frequent in Latin; and hence the Anglo-Saxon *scyran*, to shear.

One of those broad analogies by which the Latin separated from the Greek, is to convert a guttural into a labial, as in *χλος*, *flos*, *χλωος*, *floridus*. Thus it may be, *cultus* became, as it were, *sultus*, *sult*, *field*, *i. e.* a cultivated ground, and not a place filled, p. 41. *Coward* is the participle of *cowe*, to bend; but the parent of this verb is *corruo*, to shrink, p. 42. *Bread* is beared, *i. e.* the produce of the earth, as *beara*, offspring, is *boren*, something born, and not from the obsolete *bray*, to pound, which is taken from the Latin *frico* or *frango*; both of which originated in the Arabic *فَرَس*, *pharac*. *Fiend*, *foe*, is the participial termination of *فِيء*, or *فِيء*, *violence*, in which, as Socrates says, there is *enmity*; while *friend* is the same form of *frau*, a woman, (from *φειω* *i. e.* the bearing animal,) and seems at first to mean a *female loved*. The letter *l*, being of the same organs with *n*, is often changed for it in all languages, as *λυμφη*, *lymphu*; *πνευμα*, *pulmo*. On the same principle, the Hebrew *נָשָׂא*, *naaph*, to marry, became *leaf*, or *love*. The Hebrew *לָחַץ*, *lhit*, and the Persian *khod*, *self*, passing to the North, gave birth to the pronoun *hit*, or, as it is farther corrupted, *it*, which, like *id* in Latin, directs the attention to something going before, and is a substitute for it. Gothic *haitan*, Anglo-Saxon *batan*, or *gatan*, to *speak* or *command*, is, perhaps, the Greek *αὐδα*, which, in Celtic, is *gwyd*, in English *quoth*, and in Latin in the compound form of *in-quit*, p. 53.

*Tight*, *i. e.* tied, and the Gothic *tian*, is from *πινσσα*, *ti fold up*, 67. *Twist* is *tortus* or *roflus*, and not that which is *twined*. *Quilt* is *coiled*, (*κωλιω*) *twisted*. *Dravght*, *drag*, is *τραχυνω*, *traho*. *Tilt* is *tilted*, lifted, from *τελλω*, *tollo* "Barren, *i. e.* barred, closed, shut", p. 72. The verbs *φειω*, *fero*, *bear*, *paro*, *parco*, *pario*, with the numerous tribes of words derived from these in all languages, owe their existence to the Arabic *barron*, the *earth*, or that which produces all things: and *barren*, we presume, meant primarily an animal having produced; and thence it denoted *infecundity*, consequent on production, or, more generally, incapacity to produce. The Hebrew *סָרַף*, *ster*, denotes any thing *close*, *sharp*, or *hard*. Hence the Greek *σφιγος*, *firm*, *rigid*; and our *stern*, p. 73. The same word in Arabic means a harsh or acute sound, and hence seemingly the English *stir*. The Arabic *سَفَر*, *seer*, which we should pronounce *steer*, denotes to flow, or to move as water does. Hence the Anglo-Saxon *stiran*, which means to cause a ship to move, which is the meaning of the hence-derived *steer*. *Stern* is that part of a ship which is thus moved. The Hebrew *גָּרַן*, *gur*, to turn, has given birth to *churn*, turning or stirring cream being the means of obtaining butter, which in Anglo-Saxon is *gyran*, 76; to *year*, which is a revolution of time; to *yarn*, which means therefore something *turned* or *twisted*, and not prepared. *Πλοος*, *pilus*, means hair on the head; hence it signified to form hair, or to grow into a head. And this is the origin of our words *pile*, *build*. *Bold* or *bald* originated in *validus*, bodily strength naturally inspiring mental energy, 79; but *bolt*, p. 128, is *βελος* or *βελτος*, the thing cast, 129. *Boar* is the Hebrew *בָּעֵר*, *bacer*, a sturdy stupid animal; but *bravon* we think is not *baeren*, but *pork*, *porken*, *proken*, *bravon*, from *porcus*, and therefore it means the flesh of a pig, 87.

*Chop*, *chip*, is something cut off, from *κοπτω*. The Anglo-Saxon *plibtan*, to pledge, is from *πλησσω* or *πληνω*, to *strike*, plight being a bargain struck. *Shut* is the same in sense and found with the Arabic *شَدَّ*, *shud*. The Anglo-Saxon *scitan* is nothing but the Hebrew *שָׁטַף*, *shit*, *nates*; and hence it came to signify the action of the nates in throwing away the excrements. We shall merely add the following list, and all the words



# GRAMMAR.

words in the laboured chapter on *abstraction* are, with few exceptions, capable of being traced in the same manner; and we desire our readers to compare the derivations here given with those of Mr. Tooke in the pages referred to.

Θεωλεω, to divulge or expose; *trull*, a public woman, p. 153. Τροστειω, to turn, *drab*, a woman that turns about, a vagabond woman, 154: hence the Gothic *treibian*, to drive about, or turn out, 155. The Arabic *علاف*, *alp*, means *food, support*, and hence *loaf*, the means of subsistence. The Anglo-Saxon has preserved the nasal aspirate *blasf*, 157. From Δοφω, a hill, came the Anglo-Saxon *blifian*, to raise to an high place; hence too *lofty, lift*, 162. רען, *rhen*, Anglo-Saxon *grenian*, virefcere, *green*. Γρησσκω, Anglo-Saxon *gercgnan*, to decay. Grey, 167, the colour of old age. שער, *shair*, *shower*. שירה, *shire*, principality. *Shire, fire, fir*. Ruga, a wrinkle. *Rough*, Anglo-Saxon *rof*, 177. יצו, *weave, woof*, Anglo-Saxon *wefjan*, 178. Τασσω, to arrange, *bind, command*; hence *taxo*, to weave; *tax*, tribute, i. e. *tag*, the thing fastened, 179. Τελω, to rise; hence *tello, tall*, i. e. what is raised. Τελλω signifies also to command, and thence it came to denote voice, or found in general; *tell, tale, toll*, the found of a bell. Τηλο, a tribute, *talio*, to pay, *toll*. Δουλειω, to slave, to toil, or, as it was formerly spelt, *tuell, ual*; *tool*, the medium of toil, an instrument. Hence, moreover, Anglo-Saxon *tillian*, *till*, i. e. to slave on the ground, cultivate the ground, 180. בר, *bar*, something added on the outside for the sake of defence, is the origin of *bar*: בריה, *barieb*, is *burgh, borough*, a place barred, i. e. secured, which in Greek is περιγυος, a tower, and in English *park*: moreover, the *bark* of a tree is ברק, *birk*, or that which separates from the tree. The Arabic *borbaan*, a nobleman, is the parent of *baron*, and to this sense of the word St. Paul alludes, in Acts, xvii. "the Bereans were more noble than those of Thesalonica." פלך, *phalk*, in Arabic means a *ship*, and this, by changing *l* into *r*, gave birth to *bark* and *barge*, 182. בור, *bur*, pit or grave, *bury*. Σωρη is *store, treasure*, 185. זרם, *zarm*, to inundate, is the Anglo-Saxon *styrnian*, to rage as a flood, and hence *storm*, 183. א.ד, *dana*, in Arabic means a body of people come together: hence *town*, 201. בית, *bet*, means a *house*, a place that holds or contains; hence *bed, abode, pot*, in Greek βεβαι, in Celtic *bedh*, the last abode of man, and *pit*. Causo, to plead, to deliberate, gave birth to *choice*, the effect of deliberation, and to *cozen*, i. e. to deceive by pleading. The Persian *shirab*, is vine, juice; and hence the Latin *forbeo*, and the English *syrup, shrub*, 209. ביהר, *mehur, morrow*, Anglo-Saxon *morgen, morn*. עזז, to heat, to dry, to evaporate by heat; hence Anglo-Saxon *drygan, drain*, 224. Ρηγο, a garment, *rug, rig*. Τραχω, *trabo*, Anglo-Saxon *drag, dragen, drone*, an insect that drags itself. שכל, *skal*, produced *skill*. The Anglo-Saxon *scylan*, to separate, seems to have come from σκελος, *leg*, i. e. to put the legs in action, to separate one from the other. *Scald*, to disperse, is σκαλλω, *jafta*; while *scale*, to weigh, is שקל, *skal*, 233. Βραχια, βραχια, is *brook*. Φυλοιοι, *foul*, Anglo-Saxon *fylan, file, defile*. Γον, *genus, knee*. Νου, *nodus, nod*, 254. Τηλο, *talic, tale, dale, dollar, deal*, 256. לעע, *leer*, Anglo-Saxon *klian* Ταρχω, *salted curds, tart* Στιγιοι, a roof, Anglo-Saxon *figan*, to ascend the roof. *Sty*, a place covered for hogs. *Stage*, a place covered for actors to entertain the people. Πλω, *fluo*, by transposing *l*, is *full, fill*. Ferveo, *fretum*, the boiling sea; hence *bruit*, noise of the boiling waves, and the Celtic *fread*, also *fret*. *Pascō*, to feed, Anglo-Saxon *byrcian*, to be occupied in feeding cattle, *busy*. דין, *din, dun, dint*, 305. Κεζμα, a small piece, *crum*, Anglo-Saxon *grymman*, to prepare small pieces by fire. *Dono*,

to produce, yield, is the parent of *do*. דום, *dum, mute, dumb*. Μωρα, *mors*, Anglo-Saxon *myrran, mar*. שכר, *samad, samad*, *smith, smit*, 416. צ. א. artz, *in Arabic arth, earth*, 417.

These specimens (and they are ample specimens) will be sufficient to enable us to form a just estimate of Mr. Tooke's merit as an etymologist. If the above are well founded, they shew that his labours have been greatly over-rated. His great error is, that by forced analogies, or rather contrary to all analogy, he has yoked together words as of a common origin, which have flowed from very different sources; and this error has arisen from his studied inattention to the operations of the human mind, to his entire want of acquaintance with the Oriental tongues, whence all the European dialects, ancient and modern, have been derived; and to his unrepentless attempt to deduce English, Latin, and Greek, from the corruptions of Latin and Greek by a barbarous people in the dark ages. Before we quit this subject, we shall make one or two observations worthy the attention of those who trace the ramifications of modern languages from their ancient stems.

In the Oriental tongues gutturals abounded, which, like other consonants, contained in themselves the vowels necessary to their pronunciation. But it is the tendency of every guttural, when become habitual, to soften down, in the rapidity of utterance, into a mere aspirate, till it at length vanishes. Thus *cornu* has degenerated into *horn*, and *χαρμη* into *humus*, and into *homo*, a creature of earth; so in the Greek, the Oriental *lhan*, a king, became *ωασσα*, to reign, which Homer pronounced *Φωασσα*. This principle has obtained in the formation of many words, derived into English through the medium of the Anglo-Saxon and the Gothic. And the instances are still more numerous where the aspirate, instead of vanishing, has been converted into the labials *v, j, or y*. Thus *wicked* is the Arabic *هكك*, *hegnak*; *worm*, the Persian *garm*; *all, hole, whole*, the Hebrew *כל, kal*; *work, ego*, the Chaldean *ארק, ark*; *cheil, strength*; hence *weal, wealth*, the strength of a state; *swall*, the strength of a town; *heal, health*, the strength of the human body. *הרט, hart, veru*.

An inattention to this principle has betrayed Mr. Tooke into many errors: thus he derives *field* from *fellid*, that is, a piece of ground in which the wood is felled; whereas we conceive it is a corruption of *cultus*; as if *saltus, full, field*, i. e. a cultivated piece of ground, precisely in the same way as *χαρμη*, became *flus*, and *χαρμη, fel, gall*. This substitution of the labial for a guttural or aspirate obtained in an early period of the Greek, and constitutes the origin of what is called the *digamma*. This digamma prevailed in the age of Homer, when the language was chiefly oral. But his poems, as being written, preserved the guttural or aspirate, the true original character, which being obliterated, caused the aspirate to prevail in time over the digamma; and thus it restored the language to its primitive purity. But the Latin, having flowed from the Greek at an early age, when the caprice of oral sounds spread uncontrolled by written letters, and having no monument of genius like the Iliad and Odyssey to correct that caprice, as was the case in Greece, adopted the digamma, and thus separated, by a broad line of distinction, from the parent tongue. We now return to the properties of nouns.

The properties of nouns are gender, number, and case. Gender, as meaning the distinction of sex, was by no means a necessary property of nouns, for the signification was sufficient to shew the sex to which it belonged. Thus, as

there

there were but two sexes, there should have been two genders, masculine and feminine, nouns meaning males being ranked under the former class, those meaning females under the latter; while the *neuter* or neither gender comprehended the names of inanimate things, or such animals as had their sex not discernible, or not necessary to be distinguished. But unfortunately the termination of nouns became a mark of gender independent of their signification; and thus nouns were considered as masculine, feminine, or neuter, as they happened to have the endings which custom usually assigned to either of these three classes. The Hebrew tongue, in its primitive purity, appears to have been exempt from this unhappy embarrassment, and the only languages known to us which have maintained the empire of common sense against the caprice of custom are the English, the Persian, and the Bengalese. In Greek and Latin the dictates of reason have so far prevailed as to cause all those nouns, whatever be their terminations, which mean males and females, to be deemed masculine and feminine; while the names of inanimate objects only are determined by the termination. In other languages, such as the Arabic, French, and Italian, this absurdity has been carried much farther, the names of inanimate objects being said to have gender: the neuter, which is only the negative of sex, is excluded; and the learner has his memory loaded with the gender of nouns which really meant things without sex, and this without any one advantage to counterbalance so much fruitless trouble, and such glaring sacrifice of common sense.

The English language, as conforming to nature in regard to the distinctions of gender, has greatly the advantage over other tongues: when rising to the rhetorical and poetical style it addresses the fancy by personification. This figure is essential to poetry. In order to interest the imagination, the subject of discourse, when inanimate, must be invested with the forms and attributes of living beings. Now, when things are thus personified or spoken of as persons, they must be represented as *male* or *female*. May they be made either? Or is there any analogy to give one the preference over the other? Let us hear what Mr. Harris (Herm. p. 44.) says on this subject. Having observed that some nouns are of such a gender from having such a termination, he thus proceeds: "In others we may imagine a more subtle kind of reasoning, a reasoning which discerns even in things without sex a distant analogy to that great natural distinction which, according to Milton, animates the world. In this view we may conceive those substantives to have been considered as *masculine*, which were conspicuous for the attributes of imparting or communicating, or which were by nature active, strong, and efficacious, and that indiscriminately whether to good or to ill, or which had claim to eminence either laudable or otherwise. The *feminine*, on the contrary, were such as were conspicuous for the attributes either of receiving, of containing, or of producing and bringing forth; or which had more of the passive in their nature than of the active; or which were peculiarly beautiful and amiable; or which had respect to such excesses as were rather feminine than masculine." On this principle the *sun*, as imparting light, is masculine; the *moon*, as receiving it, feminine. The *sky*, or *æther*, *time*, *death*, the *ocean*, the *Supreme Being* are all masculine; while the *earth*, *ship*, *city*, *virtue*, *religion*, are feminine. And yet Mr. Tooke roundly pronounces this reasoning fallacious. "As for Mr. Harris's poetical authorities, the Muses are bitter bad judges in matters of philosophy. Besides, that Reason is an arrant despot, who, in his own dominions, admits of no authority but his own. And he is particularly unfortunate in the very outset: for his very first instances,

the *sun* and the *moon*, destroy the whole subtlety of this kind of reasoning. For Mr. Harris ought to have known that in many Asiatic languages, and in all the northern languages of this part of the globe which we inhabit, and particularly in our mother language, the Anglo-Saxon, *sun* is feminine, and *moon* is masculine," vol. i. p. 54. The author of the learned treatise on grammar in the *Encyclop. Britannica*, 17, relying no doubt on the authority of Mr. Tooke, thus pronounces on the reasoning of Mr. Harris; "Such speculations are wholly fanciful; and the principle on which they proceed are overturned by an appeal to facts. Many of the substantives that in one language have masculine names, have in others names that are feminine, which could not be the case, were this matter regulated by *reason* or *nature*."

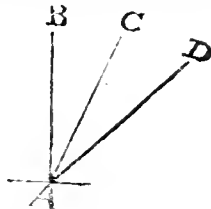
The languages from which the objection to Mr. Harris's theory is derived are *not* regulated in regard to the distinction of gender by reason or nature. And facts borrowed from them are not surely to be admitted as conclusive against a principle in a language which *is* regulated by reason and nature. Mr. Harris deduced his theory from the English, though he has applied it with perhaps more fancy than truth to some instances in the classical languages. Our own tongue, as making all things neuter which have no life, admits the operation of fancy in personifying inanimate objects; and where personification is admitted, the *analogy* to the natural distinction of the sexes must necessarily be admitted also. But, Mr. Tooke and his abettor say, it is *fanciful* because it does not obtain in other tongues. Their argument is briefly this:—The *sun*, by personification, is not made masculine in English, where the consideration of gender is founded on reason, because it is made feminine in some languages where the termination, and not reason, determines the gender. Reasoning of this kind is not only inconclusive, but frivolous; and the analogy stated by Mr. Harris invariably and necessarily operates on our own tongue, and would have operated in *all* tongues, if, like the English, they had conformed to the standard of nature; and we ought no more from their caprice to argue against the dictates of reason and analogy, than we ought to deny a regard to the distinction of sex in the nouns of one language, because the gender of the same nouns in others is regulated by considerations independent of sex.

When a noun represents its object as *one*, it is said to be in the *singular*, and *plural* when meaning more than one. This property also can hardly be said to be necessary to nouns, as its place might have been supplied with greater accuracy by numerical adjectives when extended to express numbers, as *two men*, *three men*, &c. "Bengal nouns," says Mr. Hallied, in his excellent grammar of that tongue, p. 68. "have neither dual nor plural numbers, I may add that neither is wanted. The *dual* is found in no modern language, and probably never existed but in the Arabic and its branches, in the Shanferit and in the Greek. That the idea of multitude is not confined to the plural number, is clear beyond a doubt, because singular nouns are used in all languages with a collective sense, almost as frequently as plurals, thus: *man love to study*, and *man loves to study*, are phrases perfectly equivalent. So also we join to a noun in the singular number an epithet of indefinite plurality to convey a plural meaning: *many a man* is written by the Bengalese *bebont nah-bonsh*. Perhaps it might be safely urged that the singular number has more occasion for an accurate specification than the plural; at least this is the only circumstance which can account for the extensive use of the article or representative of unity in most of the modern dialects of Europe."

The plural number in its origin was no other than a noun.

of multitude, annexed to that preceding it, in order to mark its extension from *one* to *many*. Thus in Hebrew, whose high antiquity unfolds to the philosophical enquirer the several steps which mankind took in the formation of speech: אֶחָד אִישׁ, *anosh beomon*, a man multitude, became contracted, for the sake of brevity, into אִישׁוֹת, *anoshem, men*. In the Chaldean and Syriac the final *m* was changed into *n*. Hence the Hebrew *cem* in Chaldean became *cen*, in Arabic *oon*, in Persian *aan*, to denote the names of animals, and *aa* inanimate things. And from this source are derived the plural terminations in *an* or *a* in the Anglo-Saxon and German tongues. The letters *n* and *s* being of the same organ, the Chaldean *en* became *es* in the formation of the Greek, or *es* in the third declension of Latin nouns. Hence, too, the plural termination *s* in English and French; while the Italian exclusively follows the analogy of the second Latin declension in *i*. Thus the plural termination in all languages, ancient and modern, appears to have been derived from one source: and that consisted of the annexation of a noun of multitude to the singular form of a preceding noun. And it is remarkable that in the Bengalese, which is but a branch of the Shanferit, this mode of expressing plural nouns is preserved to this day; as, *projaa*, a peasant, *projaa-lok*, peasant-people, *projaa-lok*, peasants; *lok* signifying people annexed to the singular noun whatever it might be. We shall only observe, that the names of classes only admit the plural form; while *proper* names in all languages are, by their signification, confined to the singular, unless many individuals by accident have the same name. The names of *families* and *nations* must likewise be excepted, which, from a regard to their signification, are necessarily *plural*.

We come next to the consideration of *cases*, which are properties of nouns, perplexed and undefined, as is evident from the different, and we may add, erroneous accounts given of them by most grammarians. The best and surest way to ascertain the nature and origin of cases, is to attend to the manner in which they were at first considered in the Peripatetic school. We adopt the words of Mr. Harris, p. 277. "The Peripatetics held the nominative to be no case, and likened the noun in this, its primary and original form, to a perpendicular line, such for example as the line



A B. The variations from the nominative, they considered as if A B were to fall from its perpendicular, as for example to A C or A D. Hence, then, they only called these variations πτωσεις, *casus, casus, or fallings*. The Stoics, on the contrary, and the grammarians with them, made the nominative a case also. Words they considered (as it were) to fall from the mind, or discursive faculty. Now, when a noun fell thence in its primary form, they then called it πτωσις ορθη, *casus rectus*, an erect or upright case or falling, such as A B, and by this name they distinguished the nominative. When it fell from the mind under any of its variations, as for example in the form of a genitive, a dative, or the like, such variations they called πτωσις παρακλιση, *casus obliqui*, oblique cases or side-long fallings, (such as A C or A D), in opposition to the other (that is, A B), which was erect and perpendicular. Hence, too, grammarians called the method of enumerating the various cases of a noun κλισις, *declination, a declin-*

*tion*, it being a sort of progressive descent from the noun's upright form, through its various declining forms, that is, a descent from A B to A C, A D."

We copy this account because it is very plausible, though we regard it as erroneous; the learned author and Annotations (De Interpret. p. 35.) from whom he derived it, being misled by the figurative language borrowed from geometry. We believe that the nominative is said to be in the right case, not because it is an erect or upright falling from the mind, but because the nominative, the verb, and its object following each other in direct succession, form one simple proposition. The nominative is the leading noun or *agent*, and the accusative is the *effect*, in which the action straightway terminates. And when other nouns are introduced, they are spoken of not directly as the agent or subject, but *collaterally* or *obliquely*, as objects to which the direct noun someway belongs. Thus the accusative as well as the nominative are right cases, or direct parts of a proposition; whereas the genitive, dative, ablative, and vocative are oblique cases, or indirect parts of a proposition.

From this simple statement, which we recommend to our readers as important, we infer, that a case did not at first mean a *change* in the termination of a noun, but the *position* of a noun expressing its relation to some other word in the sentence. And our next object is to ascertain those leading relations which the position of a noun, or some other means more specific, expresses. *God made man* is a sentence in which the agent, the action, and the object follow each other in the order of nature: *God*, as occupying the place of the agent, is the nominative; and *man*, as corresponding to the effect, is the accusative. But in the sentence *God is good*, we cannot say *God* is the agent, because the verb *is* does not express an action, but serves only to connect the epithet *good* with *God*. The nominative, therefore, here expresses not the agent, but the *subject* of the attribute connected to it. The nominative case, then, is that leading state or position which expresses the *subject* of a connecting verb, and the agent of an active verb. And the accusative is that position which expresses the effect of an active verb, and thus far simple position will carry us: and the nominative and accusative have evidently to each other the relation which a cause has to its effect, and that for no other reason, but that their order corresponds to the order of cause and effect.

But suppose that my purpose was not only to express a cause or agent, but the *origin* of that cause, or the *instrument* by which it acts, or the *end* for which it acts. In such cases simple position will be of no avail. I must have recourse to some other expedient, and no expedient so well can serve as suitable words to express origin, instrumentality, and end. "Thus, the *Son of God* redeemed mankind—he redeemed them *by his death*—he redeemed them *for happiness*. In the first sentence, *of* means beginning or origin: and *God*, preceding it, as being the origin of *son*, is said to be in the *genitive* case. In the second, *by* denotes instrumentality, or medium; and as *death* is the instrument or medium by which Christ redeemed man, it is said to be in the *ablative* case, and might more properly be said to be in the *instrumental* or *medial* case. In the third instance *for* expresses the *end* for which Christ redeemed man: the noun happiness succeeding it, is therefore in the *final* case, or as it is commonly, though unmeaningly, called the *dative* case."

The cases, then, or those leading positions of a noun that answer the purposes of speech, are the nominative, accusative, genitive, ablative, and dative. Let it be added, that the nominative, as it implies the name of its object, is often used merely to address a person, and thus to fix his attention. In this state the noun is said to be in the *vocative* case, and is

sometimes preceded by the interjection O! But we have not yet done: the nominative and accusative are expressed by position; while the oblique cases, the genitive, ablative, and dative depend on words expressing beginning, medium, and end. Let us a little contemplate the consequence of these words, or words of the same import, when first introduced into discourse. As the relations of things are in the order of our ideas *consequuntur* upon the things so related, prepositions denoting those relations must at first have succeeded the nouns which they now precede and govern. Thus in the above instances, the order would have been *God of—dealt by—happiness for*. And it is remarkable, that in the Hindoostanic the prepositions to this day generally succeed the dependent nouns, instead of going before them, as in other tongues. The consequence of this was, that the prepositions, abbreviated perhaps into single letters, coalesced with the preceding noun, forming thereby one word with it. Thus *godof, godby, godfor*: and the variety of terminations given by this means to the noun is the origin of cases. Modern tongues, in rejecting this variety, and substituting prepositions, have only recurred to the original purity of language.

Grammarians have generally concurred in defining cases to be changes of termination. In this, if the above account be just, they are mistaken, not only because *position* is the primary and essential idea of a case; but because while they reject prepositions as marks of cases, the cases defined by them are no other than the prepositions which they reject. Conformably to this notion, they maintain that the English noun has no other than the possessive case: and Dr. Lowth and Mr. Lindley Murray, pursuing the same error to its consequences, comprehend nouns expressing the relation of object, the relation of beginning, the relation of medium, and the relation of end, under one unmeaning phrase of *oblique case*, thus confounding relations the most necessary to the purposes of speech, the most distinct in themselves, and most requisite to be kept distinct in the mind.

The ideas of the most acute and learned grammarians have hitherto been confused and contradictory on the subject of cases, especially the oblique cases. And the author of the treatise in the Encyclop. Britannica has just left the matter obscure and uncertain, as he found it. "The genitive, says he, is the most general of all the cases, and gives notice that some connection indeed subsists between two objects, but does not point out the particular kind of connection. That we must infer, not from the nature or termination of the genitive itself, but from our previous knowledge of the objects concerned. That the genitive denotes merely relation in general, might be proved by adducing innumerable examples, in which the relations expressed by this case are different." These observations clearly shew that this writer did not himself understand the meaning of the genitive case, which, instead of expressing *some connection* between two objects, or *mere relation in general*, uniformly expresses one and the same relation, namely, that of *beginning, source, and origin*; and *of*, the mark of it, has uniformly the same sense with *from*. Thus a table of wood, a table *from* wood; wood being the origin of the table. Rays of the sun, rays *from* the sun, the sun being the origin of the rays. And *beginning* will appear to be the primary idea implied in *of*, if we trace it to its origin; *of, ab, a, ex, de, ab, pro, from, from, ex, out*. Thus also in Latin *Dei gratia*, the grace of God, the grace from God, the grace of which God is the source. Of the phrase *injuria regis* the writer says, no man can know whether the injury originated to be an injury *suscepted*, or an injury *inflicted* by the king. We deny this: if the terms be used in strict propriety they must mean an injury from the king, an injury of which the king is the source and author; and, if they are intended

to denote an injury received by him, the expression is incorrect and ambiguous, though the ambiguity would be removed by the context: and this leads me to remark, that as the beginning of a thing is the *author* of it; and as the author has a full right to the fruits of his labours, so that state of the noun which expresses beginning came to signify the *owner* or *possessor*. And thus the genitive in Greek and Latin expresses the relation of possession, and answers to what is called in English the *possessive case*. Thus, *my father's will* may mean the will of which my father is owner; it means also the will which originated in my father. The possessive case, in our tongue, is an evident abbreviation of the genitive termination of the third declension in Latin, *patris house, father's house*, the apostrophe above supplying the place of the excluded vowel.

The same writer has not defined the meaning of the *dative*, though the relation denoted by it is the most obvious of any, contenting himself with saying, that it has nearly the same sense with the accusative, &c. No two relations, however, can be more distinct; as the accusative expresses the effect of an action, and therefore stands immediately connected with that action; whereas the dative denotes the *end* to which a motion or action tends, and in which it terminates, or the point to which the attention is directed forward, as that to which something else is related. Thus, in the instance given by him, *comparo Virgilium Homero*. The immediate object of comparison is *Virgil*, and *Homero* is the point, or standard placed before me in making that comparison. The two first words express the action and its effect, the last holds to view the point to which they are directed. It is true that in this and similar instances, the mind brings under one view the person compared and the person to whom the comparison is made; and this proximity or juxtaposition constitutes the affinity which the writer erroneously supposes to be between the two cases. *Antonius lesit Ciceronem*, and *Antonius nocuit Ciceroni*, he farther supposes to be expressions of the same import; but in this he has been misled by the genius of our tongue, which would express each phrase by *Antony hurt Cicero*. But this is the exact meaning of the first clause only. In the second clause *nocuit* expresses not an *action*, but asserts a *quality*. Antony was hurtful to Cicero. Antony was hurtful, and Cicero was a person to whom his hurtful behaviour was directed.

The dative case stands opposed to the genitive as *end to beginning*. The latter is the point where motion *begins*, the former where it *terminates*, and the ablative is the medium or instrument between both. In consequence of this connection between the ablative and the genitive, on one hand, it came in Latin, by the mere impulse of repeated associations, to mean in many instances the same relation with the genitive, and this is the reason why the same word often governs a genitive or an ablative, why in our own tongue *of* and *from* have precisely the same signification, and why the French and Italian express the genitive by those prepositions which in Latin govern the ablative. On the other hand, as the instrument or medium is connected with the end, the ablative holds a similar connection with the dative. Hence in Latin these two cases are often used one for the other, which is certainly a great impropriety in that language, and which occasions much perplexity to the learner; while in Greek, which has not a distinct ablative, the relations of instrumentality and end are expressed by the same termination, which is certainly a great defect in that elegant and copious language. Instrumentality implies *concomitancy*; but this is not the primary sense of the ablative, as the author of the above treatise erroneously supposes.

*The Origin and Properties of Adjectives.*

Things or substances are known and valuable on account of their qualities; the qualities of things therefore first engaged the attention of mankind. And as they perceived that the same quality existed in the same or in a different degree, in different things, men, however rude or uninformed, learned to form ideas of qualities independent of the substances to which they belonged. Hence they acquired that class of words called *adjectives*, which are only the names of qualities. Now as qualities result from things, the names of qualities are derived from the names of things; and, as moreover qualities are constant concomitants of the things they characterize, the names of qualities are constant adjuncts of substantives expressed or implied. Hence they are sometimes called *nouns*, because they have been borrowed from nouns; and always called *adjectives*, because they are always *adjoined* or *added* to nouns, and for this reason they have also the name of *adnoms*. From this account of adjectives we deduce the following inferences, which are worthy of attention.

First, adjectives expressing the simple qualities of natural objects, which do not imply *motion* or *action*, are derived from nouns, by the mind first abstracting the quality from the thing it qualifies, and then generalizing it so as to make it an epithet expressive of a similar quality in different things. Thus in  $\pi\epsilon\pi\tau\omega\varsigma$ , a *sleep rock*, the quality *sleep*, contemplated first as a quality of that particular thing, the mind soon learned to consider as *separate* from the rock, and hence to make it a general term of the like quality in other objects. Thus was derived the adjective  $\pi\epsilon\pi\tau\omega\varsigma$ , *pronus*, prone. And in the manner this single adjective is formed, are formed all the adjectives which exist in all languages.

When adjectives became numerous in any language, analogy or custom soon assigned them a particular termination. Hence, on every conversion of a noun into an adjective, that adjective immediately assumed the ending which analogy had appropriated to words of that class. Thus  $\sigma\omega\sigma\tau\epsilon\rho$ , *food*, *relish*, was changed into *probus*, signifying agreeable food or wholesome relish. Thus also *wood*, *wind*, became *wooden*, *windy*, in our own tongue. It is obvious from this to observe, that in the earlier periods of human language, adjectives approached nearer in meaning and termination to the nouns whence they were derived; that is, they were less abstracted and generalized. But the principles of abstraction and generalization were greatly facilitated, when a quality was once expressed by an independent word; the eyes and the ears being made by that means to aid the conceptions of the mind. This is the reason why a barbarous people have few or no adjectives; and why, in the more ancient dialects of the East, the use of adjectives is far less frequent than in the more recent languages of Europe.

In speaking of the qualities of things, *similitude* or *resemblance* is an idea of high importance and frequent recurrence. A person discoursing to another of something *unknown*, naturally says, that it is *like* to some other that is known. Thus in Greek  $\epsilon\iota\kappa\alpha$ , *image*;  $\epsilon\iota\sigma$ , *form*;  $\epsilon\iota\sigma$ , *like*; are combined with nouns in order to express likenesses;  $\alpha\lambda\theta\epsilon\iota\sigma\tau\iota\mu\omega\varsigma$ , *man-like*;  $\epsilon\pi\iota\sigma\tau\epsilon\delta\epsilon\iota\sigma$ , *having the form of Hector*, *Hector-like*, i. e. *the son of Hector*;  $\alpha\lambda\theta\epsilon\iota\sigma\tau\iota\mu\omega\varsigma$ , *man-like*. This last termination, by inserting *s*, gave birth to the Latin adjectives in *osus*, and to our adjectives in *ous*; *pecunia*, *pecuniosus*; *glory*, *glorious*. The numerous adjectives and adverbs in English are formed on the same principle. *Earthly*, i. e. *earth-like*, which is the Greek  $\epsilon\pi\iota\gamma\eta\iota\omega\varsigma$ . *Gladsome* is *gladlike*, the *same* with *glad*; *some*, or *same* being, we conceive, corruptions of *similis*. The termination *ish* is originally the Persian  $\tau\omega\sigma\theta$ , added to a

noun to express likeness; as  $\sigma\alpha\tau\epsilon\tau\omega\sigma\theta$ , *the moon*;  $\gamma\epsilon\sigma\tau\omega\sigma\theta$ , *moonish*, *like the moon*;  $\gamma\omega\mu\alpha\tau\omega\sigma\theta$ , *like a woman*. The termination *en*, derived, it is allowed, from the northern language, is borrowed by that language from the Greek participle  $\epsilon\iota\sigma$  in *en*. In the same manner we form our adjectives on the analogy of the past participles in *ed*, as *I said*, *we did*; while that of *y* is the Anglo-Saxon *ig*; but this is only the Latin termination *cus*; as *unicus*, Anglo-Saxon *anig*, *any*.

But it must not be omitted that a very numerous class of adjectives is derived from *verbs*, and that independently of participles. Of this origin are all those adjectives whose qualities pre-suppose *motion* or *action*; and they imply greater power of abstraction than those derived from nouns. Mr. Tooke, indeed, denies this power as a principle influence in language; and by this rejection is led to deny the existence of adjectives as a class distinct from nouns. His definition is the following. "An adjective is *the name of a thing*, which is directed to be joined to some other name of a thing." (Vol. ii. p. 241.)

As his authority on the subject of language is so high in the estimation of many, we shall briefly examine and refute the above definition. His arguments are these; "I think you will not deny that *gold* and *brass* and *silk* is each of them the name of a thing, and denotes a substance. If then I say a *gold-ring*, a *brass-tube*, a *silk-string*, here are the *substantives* used *adjectively*, *y* is the name of things, and denoting substances. If again I say a *gold-ring*, a *brass-tube*, a *silk-string*, do *gold* and *brass* and *silk* cease to be the names of things, and cease to denote substances, because, instead of coupling them with *ring*, *tube*, and *string* by a hyphen thus (-), I couple them to the same words by adding the termination *en* to each of them? Do not the adjectives which I have made such by the added termination *golden*, *brassy*, *silk* convey to the hearer's mind, and denote the same things as *gold*, *brass*, and *silk*? Surely the termination *en* takes nothing away from the substantives *gold*, *brass*, and *silk*, to which it is united as a termination; and as surely adds nothing to their signification, but this single circumstance, *viz.* that *gold*, *brass*, and *silk* are designated by this termination *en* to be joined to some other substantive;" p. 430. Again he says, p. 442, "But if, indeed, it were true that adjectives were not the names of things, there could be no attribution by adjectives; for you cannot attribute *nothing*. How much more comprehensive could any term be by the attribution to it of *nothing*? Adjectives therefore, as well as substantives, must equally denote substances; and substance is attributed to substance by the *adjective* contrivance." He concludes with what Dr. Jonathan Edwards says of the language of the Mallickanew Indians. "The Mohicans have no adjectives in all their language, although it may at first seem not only singular and curious, but impossible that a language should exist without adjectives, yet it is an indubitable fact."

This account, instead of unfolding that simplicity and precision which mark the process of the human mind in the formation of language, tends to erase the very elements of knowledge, and to confound ideas the most palpable and distinct. Our ideas naturally and obviously divide into two classes, ideas of qualities and ideas of things. The distinction between these classes is universal; it is essential to the philosopher and the bulk of mankind; and is not readily comprehended even by children. As we have then *ideas* of qualities, language must have *words* to express those qualities, i. e. it must have *adjectives*; and as we have *ideas* of things, language must have *words* to express those things, i. e. it must have *nouns*. These two classes of qualities and things are in their nature distinct from, though concomitant ideas of things; so adjectives must in their nature be distinct from, though adjuncts of nouns.

The first step in the formation of adjectives is *abstraction*; the mind being led to conceive of the quality independent of the thing, in consequence of perceiving it in *different* things. The frequent recurrence of the quality, which is one and the same, and therefore remembered, while the substances which present it are numerous and successive, and therefore forgotten, greatly facilitates our abstract conceptions. A similar facility, as we have already observed, is afforded by the independent use of words to express qualities. The dependence of adjectives on the principle of abstraction is evident from one circumstance. *Like* is a very abstract quality; and the union of this word with nouns is one copious source of adjectives in most languages of which we have any knowledge.

The next step in the formation of adjectives is *association*. This principle is so powerful and instantaneous, that it changes the nature of a word, in consequence of its connection with other words, and of our previous experience. Thus, "the ladies *fan* themselves"—"The plummy people *eye* the falling verdure." Because we have experienced the middle term of a simple direct proposition to be always a *verb*, we instantly, in the above examples, conclude that *fan* and *eye* do not here denote the things usually meant by them, but the *operations* of those things; that is, association and experience convert the nouns *fan* and *eye* into verbs, without any thing to aid or indicate that conversion but association suggested by the collocation. This conversion of a noun into a verb by simple experience, illustrates the conversion of a noun into an adjective. We place a word signifying a quality before a word denoting a substance; and as we uniformly find that qualities belong to the things which they qualify, and first act upon our perceptions, we instantly infer from the collocation that the first expresses an attribute of the second; and this attribution is not indicated by the termination of the attributive, but an *inference* of the mind founded on experience. The termination *en* signifying *to be added* is a conceit of this grammarian, and has no foundation in truth: for it is the Greek participial termination in *on*, borrowed by the Goths. The formation of language did not require such petty, circuitous contrivances; but points to the broad and simple principles of abstraction and association as the copious sources of all its phenomena.

From this it appears, that a peculiarity of termination is not necessary to form an adjective, the collocation being sufficient to ascertain its character as such. An adjective may have the same ending with any other noun, or with the very noun from which it was derived; and it has this identity of termination in Greek and Latin, and yet no ambiguity arises as to its nature and use. The inference, which we instantly, and we may say, imperceptibly, draw from the *juxtaposition* in our own tongue, and from the similarity of terminations in the classical tongues, is an unerring guide in these respects. And this is the reason why, in a barbarous language, it is possible that the name of a quality may be always the same with the name of the thing to which that quality belongs, and yet abound with adjectives, *i. e.* abound with nouns converted into adjectives by juxtaposition. And this is all that can be meant by the testimony of Dr. Edwards, in regard to the language of the Mohegans. If there existed a language which had no verbs, but nouns converted (as in the above instance of *fan* and *eye*) into verbs without any variation of termination, a person who did not understand the nature of the human mind, and who had been accustomed to classify words only by their endings, might say of that language, that it had *no verbs*.

The foundation of Mr. Tooke's error, is the circumstance

that most adjectives were originally nouns. As they were nouns *in their origin*, and as he rejected the operations of the mind in the construction of language, he inferred with confidence, that they were nouns *still*, thus confounding in one promiscuous mass our ideas of qualities, and our ideas of things; yet, notwithstanding this confusion, he writes thus: "If in what I have said of the adjective, I have expressed myself clearly and satisfactorily; you will easily observe that adjectives, though convenient abbreviations, are not *necessary* to language; and, therefore, are not ranked by me amongst the parts of speech; and, perhaps you will perceive, in the misapprehension of this useful and simple contrivance of language, one of the foundations of those heaps of false philosophy and obscure (because mistaken) metaphysic with which we have been bewildered."

Adjectives, as expressing not things, but their qualities, cannot, in strict propriety, have any *gender*; but, as in Greek and Latin, they have the same terminations with nouns, they are said to be masculine, feminine, or neuter, merely as they have masculine, feminine, or neuter terminations.

In most languages, adjectives vary their endings to correspond with the plural form of nouns; in English they have no such variation, nor is it necessary, since qualities are not susceptible of numerical distinction, being the same, whether applied to one or to many.

There is, however, one variation which adjectives have in all languages, namely, the variation to express the three degrees of comparison. The qualities of things differ in different objects, and they must be expressed with *augmentation* or *diminution*, as they are compared with others more or less intense.

When a quality is expressed without reference to any other, the adjective is then said to be in the *positive* degree. When expressed with reference to the same quality or to another more or less intense, it is said to be in the *comparative* degree; and when in the highest or lowest degree of all, it is in the *superlative*. Different languages have different ways of forming the comparative and superlative; but in almost all, both these degrees are derived by certain syllables added to the positive: the adjective itself, by being thus *lengthened*, is made to correspond with the augmentation in sense, which the quality acquires by comparison. The mode of expressing the degrees of qualities being only *two*, and therefore very general and imperfect, while the qualities themselves vary in endless gradations, a more adequate method is used, by having recourse to those attributes of an inferior order, called *adverbs*, as *much good*, *tearably good*, *exceedingly good*, *more good*, *most good*.

As it is not our object to detail the minute rules of grammar in our own tongue, we shall conclude this part of the subject with one or two observations on the three degrees of comparison. The positive degree, though not implying an immediate comparison with the same quality in a higher or lower degree, often conveys a *relative* or *comparative* idea; and for this reason may, by the assistance of a preposition, be made to express the comparative or superlative degree, as "Blessed among women, *i. e.* the most blessed of women." And this relative or comparative idea, implied in the positive, is the reason why the positive has sometimes after it the case which is used after the comparative. On the other hand, the comparative and superlative are used in a positive sense, or used to express a high degree without any immediate object of comparison. Thus Virgil speaks of Venus: "Tristior et lacrymis oculos suffusa nitentes."—*Tristior*, more sad than usual, *i. e.* very sad. This is more usual in the superlative degree, *vir doctissimus*, a very learned man. The comparative is used with propriety only when *two* things are compared;



the superlative when a thing is compared with *many*. The elder of the two—the eldest of all. Nevertheless it is to be allowed, that multitude may be the object of the comparative, if preceded by *all* or *wholly*, to give it a collective idea; as, “he is wiser than all his teachers, *i. e.* he is wiser than the whole body of his teachers,—he is wiser than them all put together;—or, compared with his teachers one after another, he is wiser than them all.”

*The Origin and Properties of Pronouns and Definitives.*

*Pronouns* have been defined substitutes for nouns, to prevent their too frequent recurrence. Mr. Harris accounts for pronouns, or, as he calls them, *nouns of the second order*, in a different way; and, as his explanation is curious, we shall here place it before our readers. “All conversation passes between individuals, who will often happen to be till that instant unacquainted with each other. What then is to be done? How shall the speaker address the other, when he knows not his name? or how explain himself by his own name, of which the other is wholly ignorant? Nouns, as they have been described, cannot answer this purpose. The first expedient on this occasion, seems to have been *pointing* or *indicating* with the finger or hand; some traces of which are still to be observed, as a part of that action which naturally attends our speaking. But the authors of language were not content with this: they invented a race of words to supply this pointing, which words, as they always stood for substantives or nouns, were characterised by the name of *pronouns*. These, also, they distinguished into three several sorts, calling them pronouns of the first, the second, and the third person, with a view to certain distinctions, which may be explained as follows.

“Suppose the parties conversing to be wholly unacquainted, neither name nor countenance on either side known, and the subject of conversation to be the speaker himself. Here, to supply the place of pointing, by a word of equal power, the inventors of language furnished the speaker with the pronoun *I*; *I write, I say, I desire, &c.*; and as the speaker is always principal with respect to his own discourse, this they called, for that reason, the pronoun of the first person. Again, suppose the subject of the conversation to be the party addressed. Here, for similar reason, they invented the pronoun *thou*; *thou writest, thou walkest, &c.*; and, as the party addressed is next in dignity to the speaker, or at least comes next with reference to the discourse, this pronoun they therefore called the pronoun of the second person.

“Lastly, suppose the subject of conversation neither the speaker nor the party addressed, but some third object different from both. Here they provided another pronoun, *he, she, it*, which, in distinction to the two former, was called the pronoun of the third person. And thus it was, that the pronouns came to be distinguished by their respective persons.”

This account, which the author, as he says, received from Apollonius, is arbitrary and erroneous. The use of the pronouns is not to supply the names of persons unknown to each other; nor can they be said to have been *invented*: for though they answer the most useful purposes, they originated in circumstances in which *design* had no concern. The origin of the two first pronouns we conceive to be this. They are the adjectives *one, two*, losing their numeral signification, and coming to mean the speaker and the person addressed, by the mere force of association with the verb. Let us suppose that a person wished, in the infancy of language, to express the proposition *I love thee*. If English were his words, he would have said, *one love two*. This form being repeatedly used, and the person using it accom-

panying the leading term *one* with a consciousness of himself, that term would gradually drop its character of *one* in opposition to *two*, and derive a new character by association from the verb, namely, *one* that was speaking in opposition to the other spoken to. Thus the same process which converted *one* in general into *one speaking*, converted *two* into the person addressed.

That the pronouns *I, thou*, were originally *one, two*, will appear probable from hence. In Hebrew, the most ancient language, the pronoun answering to *I* is evidently the parent of the numeral *one*; and *two* has a close resemblance to *thou*. Thus אֲנִי, *ani*, *ego*, is אֶחָד, *ekhi*, is *unicus*. Moreover, אַתָּה, *ato*, by dropping אֶ seems to have produced תּוּ, *tu, thou*; and הוּא, *duo, two*. And in other tongues the pronoun *thou* and the numeral *two* have such resemblance as to bespeak one common origin in Hebrew. Besides, the pronouns *I* and *thou* still retain their origin in their names; *I* being the *first* person, *thou* the *second*; not because the former is the first and the latter the second in dignity, but because these were their original meaning. Moreover, the numerals *one, two*, must have been among the first adjectives formed by abstraction from such things as nature produced in pairs, or those which alternately succeed each other, such as *day* and *night*. And as discourse is but an *alternation* or *interchange* of sentiments between *two* persons, the numeral adjectives in question were the most likely to be used on such occasions. Remains of this usage may be still traced in some languages, as we say, *One thinks so*, or in French, *On dit*; *one* being not as Condillac (see his Works, tom. v. p. 184.) asserts, a corruption from *homme*, but of the Latin *unus*, and is not a substantive, but a substitute for a substantive, *i. e.* a pronoun. Finally, we observe that no words but *numerals* were capable of being formed by association into pronouns. The speaker, indeed, might use his own name, and which, when repeatedly used, the verb would convert into the first person. But on the same principle another would employ his own name, and thus the associations of one man would counteract the associations of another; and neither name would be received as the representative of the speaker.

From this statement of the origin of the pronoun, some particulars respecting its nature and use may be deduced with precision. First, the adjective, in being changed into a pronoun, loses the generality of a numeral, and assumes an individual character; that is, the character assigned to it by the verb. But as any other person may use that term in similar circumstances, the pronoun *I*, which was changed into the index of an individual by association, becomes again *general* by succession; each speaker having a right in his turn to use it; and thus the pronouns *I* and *thou* became substitutes for the names of all persons in a change of situation. Secondly, *I* and *thou* are not, as has been supposed, substitutes for the names of the speaker and the person addressed, to avoid their too frequent repetition, nor yet substitutes for those names while yet unknown, but representatives of those persons in that limited or restricted character which they derive from the associated verb. Now as *speakers* there is no difference between a man and a woman. A man that speaks and the woman that speaks, in that particular function, is the same; and the same thing holds in regard to the person addressed. The first and second persons, therefore, have not, in any language, the distinction of gender merely; because they represent human beings in that particular character which excludes the idea of sex. Thirdly, there is, properly speaking, no such thing as a *third* person; this being a *definitive*, marking the subject of discourse, and said to be the third person in refer-

ence to the *first* and *second*, and thus represented as something distinct from them, and not included under them. Thus  $\alpha\gamma\tau$ , *ho*, in Hebrew, and *he* in English, were, as we shall presently see, but the article; and so  $\epsilon, \delta\tau\omega\sigma, \epsilon\sigma\omega\sigma, \alpha\upsilon\tau\omega\sigma$  in Greek, and *hic, ille, is, ipse*, in Latin, are all a species of restrictive or definitive adjectives, agreeing with the defined noun expressed or implied. As the first and second persons represent two individuals in peculiar circumstances, they comprehend no other noun under them; whereas the third person is only in general a subject of discourse, and therefore it comprehends any noun in the language, excepting the first and second: accordingly every subject or agent in every language is the third person singular and plural, except four, *I, thou, we, and ye*, or their equivalents. The first and second person, we have seen, exclude the idea of sex, whereas it is a character often necessary to be marked in the subject or agent: for this reason pronouns of the third person have the triple distinction of masculine, feminine, and neuter.

All the three persons admit the plural number, as each is capable of representing numbers. In our own tongue *I, we, thou, you* or *ye*; *he, she, it, they*. Here it may be observed that *ye* is a corruption of *you* or *you* abbreviated; and as this abbreviation naturally takes place in the nominative or vocative, when the persons addressed are called; and as it is necessary to be distinct when expressing the addressed persons as affected by a verb, *ye* is used with propriety only in the nominative or vocative, and *you* in the accusative. Men of rank being usually surrounded with attendants, it became a compliment to address a person as such; in the same manner as in Greek,  $\tau\alpha\ \pi\alpha\ \pi\epsilon\gamma\gamma\omega\sigma$ , *those around Priam*, was a respectful way of designating Priam. Hence in common discourse we use *you* for *thou*; and on such occasions the verb also should be in the plural; as *you were* and not *you was*. But this complimentary style is not applied to the Supreme Being, who is always addressed by *thou*, from a regard, probably, to his *unity*, numbers being not able to add to his dignity or greatness. The regal style *we* has respect to the king's counsellors, who are supposed to advise the subject of discourse, and who are responsible for it. With regard to the third person, though it be convenient to mark the gender, it is not essential: for the plural *they* is made to represent men, women, and things, without any inconvenience or ambiguity.

The personal pronouns, contrary to the analogy of nouns, have each three terminations, or three variations, to denote cases. This is owing to their being derived from the Greek and Latin, with their respective inflexions. Their genitive, dropping the primary sense of *beginning*, has uniformly the secondary sense of *possession*. Hence it is called, in our tongue, not improperly, the *possessive case*.

In Hebrew, Arabic, and Persian, the personal pronouns are converted into adjectives, by being annexed to nouns, which, from their position, are called *affixes*. In this state they are somewhat abbreviated and changed: but however changed when connected with nouns, they are always adjectives, but retain their personality when affixed to verbs. In our own tongue the personal pronouns are changed into adjectives from the genitive or possessive case: as *mine, my; his, thy; hers, ours, yours, theirs; her, our, your, their*. Thus formed, they are properly called *pronominal adjectives*—adjectives, as qualifying nouns, and pronominal, as derived from the personal pronouns. *His* must be considered, by coalescence, as an adjective of this kind, through the genitive *hi's*. These pronominal adjectives, as derived from the genitive, may be resolved into the signification of that case: as *my* of *me*; *thy* of *thee*; *his* of *him*, though seldom in English used in their personal form. The reason is, that our tongue has a strong propensity to convert nouns into

adjectives by juxtaposition, and thus to use them for the sake of brevity, instead of the genitive: as when we say *silk-string* for *string of silk*, and *gold-ring* for *ring of gold*. The Greek and Latin do not abound with the same analogy, and therefore frequently use the personal pronoun in the genitive as equivalent to the pronominal adjectives.

The reciprocal or reflex pronoun *self* is added to these pronominal adjectives: as *myself, thyself*, &c. The third person singular and plural by analogy should be *his-self* and *their-selves*; but in order to humour the ear or the organs of speech, these are changed into *himself* and *themselves*. *Self* means an individual in opposition to another, and is derived from the Latin *solus*, alone, through the medium of the Anglo-Saxon *sola*, *soul*, Anglo-Saxon *safel, self*: hence also *soul*, which means that part of man in which consists the vital principle in opposition to the body: *own*, often used to precede *self*, is a corruption of the Anglo-Saxon *egen*, which by the insertion of the letter *g*, after the analogy of that language, is borrowed from the Latin *unus*. *Ownself*, therefore, is *oneself*.

Mr. Harris gives the following account of that species of adjectives called *definitives* or *articles*: "The visible and individual substances of nature are infinitely more numerous than for each to admit a particular name. To supply this defect, when any individual occurs, which either wants a proper name, or whose proper name is not known, we ascertain it as well as we can, by referring it to its species; or if the species be unknown, then at least to some genus. For example, a certain object occurs with a head and limbs, and appearing to possess the power of self-motion and sensation: if we know it not as an individual, we refer it to its proper species, and call it *dog*, or *horse*, or *lion*, or the like. If none of these names fit, we go to the genus, and call it animal."

"But this is not enough: the thing at which we are looking is neither a species nor a genus. What is it then? An individual. Of what kind? Known or unknown? Seen now for the first time, or seen before, and now remembered? It is here we shall discover the use of the two articles *a* and *the*. *A* respects our primary perceptions, and defines individuals as unknown: *the* respects our secondary perception, and denotes individuals as known. To explain by an example: I see an object pass by, which I never saw till now. What do I say? There goes *a* beggar with a long beard. The man departs, and returns a week after. What do I say then? There goes the beggar with the long beard. The article only is changed, the rest remains unaltered. Yet mark the force of this apparently minute change. The individual, *once vague*, is now recognized as something known, and that merely by the efficacy of this latter article, which tacitly insinuates a kind of previous acquaintance, by referring the present perception to a like perception already past.

"The truth is, the articles *a* and *the* are both of them definitives, as they circumscribe the latitude of genera and species, by reducing them for the most part to denote individuals. The difference between them, however, is this: the article *a* leaves the individual itself *unascertained*, whereas the article *the* ascertains the individual also, and is for that reason the more accurate definitive of the two."

We give this statement as that of an eminent grammarian, without subscribing to it as just in all respects. It is not, we conceive, true, to say that the individual defined by *a* is always *unascertained*; nor does *the* necessarily imply a previous acquaintance, by referring the present perception to a like perception already past. And we cannot help observing that, if Mr. Harris and other writers on the subject had traced these words to their sources, and thus ascertained their primary meaning, their readers would have been more inform-

ed in one paragraph, than they otherwise could by the most elaborate treatise.

The article *a* is in truth the numeral adjective *is* in Greek, *unus* in Latin, *æn, an, aw,* in Anglo-Saxon: and the import of it precisely corresponds with its original signification of *one*. A book is one book; a man is one man. Hence we may learn with certainty the following particulars. That it is enveloping the word in mystery to call it an *article*, instead of calling it by the more appropriate name of *numeral adjective*, or *definitive*. That as it means *one* it cannot be prefixed to plural nouns, unless those nouns be taken in a collective sense. That the usual rule, *a* becomes *an* before a vowel, should be just reversed in order to be true. "*An* becomes *a* before a consonant." That the equivalent of the article *a* exists in Greek and in Latin, but is rejected as useless in those languages; and that the frequent use of it in English and other modern language is so far from being necessary, that it is an incumbrance and inelegance. *I see a man* would be as intelligible as when we say *I see a man*; and *they read a book*, as definite, as *they read a book*; and this, from the nature of the case, just as in Latin, *videt hominem, legunt librum*, where *unum* would be both unnecessary and inelegant. The English *I see a man*, and the Latin *videt hominem*, are both equally indefinite in themselves; but they are sufficiently limited by the nature of our perception, and by previous experience. "The indefinite article," says the author of the treatise on Grammar in the Encyclop. Britannica, "is much less useful than the other; and therefore the Greek and Hebrew languages have it not, though they both have a definite article. In languages, of which the nouns, adjectives, and verbs have inflexion, no mistake can arise from the want of the indefinite article; because it can always be known by the terminations of the noun and the verb, and by the whole circumstances predicated of the noun, whether a whole species or one individual be intended. But this is not the case in English. In that language the adjectives having no variation with respect to gender and number, and the tenses of the verbs being for the most part the same in both numbers, it might be often doubtful, had we not the indefinite article, whether the specific name was intended to express the whole species or only one individual." All this reasoning, however, appears to us fallacious, and only shews that even a wise and able man, such as the writer of this article certainly is, will readily think that necessary and useful to which he has been accustomed, and therefore will seldom be at a loss for some plausible reasons to justify it. In truth, the inflexions of adjectives and verbs in the learned languages alluded to, have no influence whatever in defining the extent of the general term, but serve merely to shew that they qualify that term, and depend upon it. The very example adduced by this writer shews the fallacy of his reasoning: Εἶπετο ἁλφειος ἀπειραμειος τῷ βασιλεὺς Ἰουδαίας. Here ἁλφειος as clearly denotes not the whole species, but an individual, as if it was written ἱς ἁλφειος, and that not because of the singular correspondence of εἶπετο, nor from the termination of ἀπειραμειος. Of this there is an evident proof; εἶπετο and ἀπειραμειος would be still the same, though ἁλφειος had a specific or collective sense. But the individual sense of the noun appears from the nature of the case, from the context, and especially from the clause, *whose name was John*: and these circumstances, which sufficiently define it in Greek, would be sufficient to define it in English, were it written "Man was sent from God whose name was John." It is impossible to feel in this *an* ambiguity; and the expression seems uncouth only because we have been accustomed to the use of *a man* was sent from God, &c.

Mr. Tooke derives *the* and *that* from the Anglo-Saxon verb

*theon* or *thegan*, to take. But the *to* derivative *est* in that language, and why should he attempt to derive them from any word, when they are already formed and employed in the same sense? He seems to have been aware of this objection. And he adds, vol. ii. p. 60, "The *to* article, as it is called) is the imperative of the finite verb *thear*, which may very well supply the place of the correspondent Anglo-Saxon article *se*, which is the imperative of *seon*, *thear*. For it answers the same purpose in discourse to say—*se man*, or *take man*." The English *take*, and the Anglo-Saxon *theon*, which this writer would lead us to regard as a primitive northern word, is only the Greek *λαβε, to accept—I take this*, therefore, means, *receive this*.

*Light* is the medium of sight, and hence, in the most ancient languages, the word signifying light gave birth to verbs signifying *to see*. Thus the Hebrew שָׁה, *tsa*, pronounced in Arabic *thao*, but in Persian *sea*, *light*, is the parent of the Anglo-Saxon *seon* and our *see*, which accords with the Persian pronunciation, and also of the Anglo-Saxon article *se* or *see*, or, as we found it, conformably to the Arabic, *the*. It is remarkable the article *is* in Greek is founded entirely on the same principle, though derived from a very different word. For its original appears to have been the Hebrew article הַ, which probably was founded *hu* or *ho* short, and which is but an abbreviation of שָׁה, *ha*. Now the use of this last consists in directing the attention to an object, and answers to *en* or *esse* in Latin, and *lehd* in our own tongue. And as the necessary consequence of looking upon a thing is to see it, as distinguished from other things, hence הַ in Hebrew, *is* in Greek, *the* in English, from signifying to perceive, through the medium of light, came to signify an effect of perception, namely, the distinction or opposition which the thing to seen has to other things which may be related to it.

From this account we may gather the following particulars respecting the nature and use of the definitive article. Its primary force consists merely in directing the eye or the attention to an object; and the definitive power assigned to it is rather an effect of the sight where the object is present, or of the mind in drawing the necessary inference, where the object is previously described or specified. If this account be just, the assertion of Mr. Tooke, that the article, in combination with a general term, is a mere substitute for a particular term, (see vol. i. p. 69) is erroneous. The article is only an index; having indicated the thing intended it does no more; the eye or the mind does the rest, and the general term is defined or made particular, by being brought under immediate inspection. It is necessary to subjoin the general term to the article, because it is necessary to specify the object intended; but the restriction of the specific or general noun to that individual object is a consequence of the article, rather than a power belonging to it. The article therefore cannot be a mere substitute, to do that which is done by another principle, namely, the eye or the mind.

The article serves as an index to specify an object hitherto unknown, as well as one previously known; and thus Mr. Harris's distinction, that *a* respects our primary perception, and denotes individuals as unknown; *the* respects our secondary perception, and denotes individuals as known, is unfounded. The index indeed may be directed to a past event or object, thus to make it the subject of inspection a second time. In this view Mr. Harris's position is true, but the use of the article is far more general, and by no means confined to such cases.

The article *the* is the same in origin, and often in use the same with *that*, and indeed in the Anglo-Saxon *that* is only the neuter gender of *the*; and Mr. Tooke ought to have made this remark instead of representing each as independent of the other.

This definitive is in our tongue variously applied; and the objects of its application are so distinct and different, that it has been thought to change its nature, and to belong to different parts of speech. And Mr. Tooke has the merit of being the first to shew that in all circumstances, *that* retains one and the same character. Let us briefly consider its various applications. And *first*, it is used to bring under the eye of the mind, *i. e.* to define individual objects; as *that* book. In this sense it is opposed to *this*, answering to *ille* as opposed to *hic* in Latin. *Ille, that*, denotes the remoter of two objects; *hic, this*, the nearer. "Alexander and Julius Cæsar were great commanders, *that* (ille) conquered Asia; *this* (hic) subdued the Gauls—*that*, meaning Alexander as the farthest off; *this*, Julius Cæsar, as the nearest." In such a sentence it would be more usual to say the *former* and the *latter*. *Secondly*, *that* is frequently used to characterize a *whole clause*, which is the object of a transitive verb, thus serving to fix the attention on what is going to be said, and by that means to render it emphatic and prominent. Thus, "I wish you to believe *that* (that thing which I am going to say, namely,) I will not hurt a fly;" which Mr. Tooke thus resolves, "I would not willingly hurt a fly; I wish you to believe *that* assertion." In this application it answers to *quod* in Latin. *Thirdly*, *that* is an index to point out the *end* or *purpose* which a person has in view, and as such precedes a verb in the subjunctive mood, expressing that end thus: "Thieves rise in the night *that* they may steal."—"Thieves rise in the night, *that* being their purpose, namely, they might steal." In this sense it corresponds to the Latin conjunction *ut*, which, perhaps, led to the error of considering *that* as a conjunction in the second and third senses. *Fourthly*, it is an index pointing to a noun in the preceding clause, and is a substitute for that noun, or rather it agrees with that noun implied, though never expressed. "The man, *that* hath not music in himself, is fit for treason." Here the first clause, *the man*, is represented as definite, while the reader as yet is not able to recognize it as such. What man is fit for treason? To preclude the necessity of this question, a clause is introduced, *that* man, namely, he who hath not music in himself. In this sentence *that* is thought to be a relative equivalent to *who*, which may be substituted for it. But in reality it is still a definitive, used to ascertain the preceding specified noun, which has the form of being definite without being really so; and the preceding noun is to be repeated, or, as *that* is *descriptive*, a generic or specific noun of the same import is understood to be introduced. Thus the man, namely, *that sort of man*, who hath not music in himself, is fit for treason. The subject of discourse may be *plural*, and yet the singular form of *that* may, on this supposition, be used. "The men *that* have not music in themselves, are fit for treason," *i. e.* the men, *that sort of men*, namely, who have not music in themselves, are fit for treason: and this is the solution of the apparent anomaly of *that* being used in both numbers, without variation, when taken relatively.

We come next to speak of the *relative pronoun*, which Mr. Harris thus explains, p. 77. "But besides those there is another pronoun (in Greek *ὅς, ὅσος*, in Latin *qui*, in English *who, which, that*), a pronoun having a character peculiar to itself, the nature of which may be explained as follows. Suppose I was to say *light* is a body,—*light* moves with great celerity. These would apparently be two distinct sentences. Suppose, instead of the second *light*, I were to place the prepositional pronoun *it*: *Light* is a body; *it* moves with great celerity; the sentence would be still distinct and two. But if I add a connective (as for example an *and*) saying *light* is a body, and it moves with great celerity; I then by connect-

tion make the two into one, as, by cementing many stones I make one wall.

"Now it is in the united powers of a connective and another pronoun, that we may see the force and character of the pronoun here treated. Thus, therefore, if in the place of *and it* we substitute *that* or *which*, saying *light* is a body, *which* moves with great celerity; the sentence still retains its unity and perfection, and becomes, if possible, more compact than before. We may with just reason, therefore, call this pronoun the *subjunctive*, because it cannot, like the prepositional, introduce an original sentence; but only serves to subjoin one to some other which is previous."

This account, though elegant and specious, we nevertheless deem erroneous; because the relative pronouns in all languages are the same in their origin and use with the articles or definitive pronouns. In Greek *ἐς* is only the article *ὁ* with *ε* annexed after the analogy of that termination in Greek nouns. Hence the reason why *ὁ* and *ἐς* are, by the more ancient writers, such as Homer and Herodotus, used for one another, either as demonstrative or relative pronouns. The Latin *hic* is also the article *ὁ* with a guttural annexed—*hoc*; while *qui*, which Scaliger, and after him Mr. Tooke, derive from *quis*, is no other than the Persian *ke* or *che, who, which*. Moreover, *quis* is the Oriental *kis, who* or *what*; and it is remarkable that in Hindoostan *kis* is redoubled *kis kis*, and this has been imported into Latin *quisquis*. Finally, our *who* is the Greek *ὅς*, having the labial *w* substituted for the aspirate, which is a broad and general analogy, by which words in Latin and the Anglo-Saxon are formed from Greek or from the Oriental tongues. *Which* is the neuter termination of *ὅς*, formed on the same principle as *hoc* in Latin, that is, a guttural is annexed to *who, whoc, which*. And this is the reason that, while *who* is applied to persons, *which* is made to stand for inanimate things.

As the relative and definitive pronouns have the same origin, they are also the same in use. For in Latin the relative always supposes the antecedent to be repeated, and is repeated when obscure or doubtful. In our own tongue, indeed, *who* never coalesces with the antecedent noun, and is therefore a *substitute* for it, and this peculiarity in our own tongue has caused *who*, with its other cases *whose, whom*, to drop its nature as a definitive, and to become really a *pronoun*, *i. e.* a substitute for a noun. This peculiarity has also obtained in regard to *he*, which was the Hebrew and Greek article *ה, ha, or ὁ*. And this is the reason why the article in Homer may be often rendered by *he* in our own tongue. Dr. Middleton, not perceiving this circumstance, was led, in a voluminous work published on the Greek article, to suppose that the Greek article is in its nature a *personal pronoun*, and may be always resolved into a pronoun. The foundation being thus fallacious, the whole super-structure, however learned and elaborate, is frivolous and useless.

We observe farther that *hic, ille, and is*, which are really definitives, often refer, like *qui*, to a preceding noun, and for this reason have a claim equally just to be called relative pronouns. Thus, "Deus nobis hæc otia fecit; namque erit *ille* mihi semper Deus; *illius* aram sæpe tener nostris ab ovilibus imbuet agnus." Here the first *ille* is *ille homo*, or *ille juvenis*, meaning *Augustus*, elegantly kept out of sight, the reader being left to conceive of him only as a *god*; while *illius* is *illius dei, of that god*. "Tres littore cervos prospicit errantes, *hos* tota armenta sequantur, *i. e.* hos cervos." "Cognoscimus Deus ex operibus ejus," we know God from the works of the same—*ejus dei*.

Because the relative *qui* is thus a definitive, the defined noun, when not antecedent, is made to succeed it in Latin, and

and in Greek, as "Maximis laboribus consequuntur eam, quam ex discendo capiunt, voluptatem;"—literally, with the greatest toil they pursue that, which pleasure, (for that pleasure, which) they derive from study. "Quas condidit arces, ipsa colat,"—let her inhabit which citadels she built, for, let her inhabit the citadels which she built. In our own tongue such an arrangement is not allowed, or even intelligible, because here the relative is really a substitute for the noun preceding it, and refuses to coalesce with it as an adjective. And it is obvious to remark in this place, that with the exception of *who* in English, the articles or definitives are not *pronouns*, but *adjectives*, numeral or restrictive, agreeing with a noun expressed or understood, and to be supplied from the context or the preceding clause. We remark, finally, that as articles are definitives, the Latin tongue has not only *one* but several articles, which it is erroneously supposed to want. Thus, *hic homo, this man, ille homo, that man*, is *homo, the same man, ipse homo, that very man*, are phrases, either of which is equally definite and emphatic with our *the man*, and on many occasions precisely the same with it.

Before we quit this subject we shall advert to a question proposed and solved by Mr. Tooke, vol. i. p. 273. "What is *as*?—The truth is that *as* is also an article; and however, and whenever, used in English, means the same thing as *it*, or *that*, or *which*. In the German, where it still evidently retains its original signification and use, (as *so* also does,) it is written *es*." Now, if Mr. Tooke had properly understood the nature of the article, he would not have made this assertion. *As* indeed, like the article, is an *index*, but it is an index directing the mind from one object to another, and the consequence of its being so directed is the perception of some resemblance between them. Accordingly *as* is *is*, an adverb of similitude in Greek, which being inverted (as is often the case with monosyllabic words), has become *so*. On the other hand, the consequence of the indication conveyed by the article is not to the observance of some likeness between the objects specified, but the limitation of the general term to the individual object, circumscribed by the eye or the mind by being so indicated.

In a note this writer adds: "Dr. Lowth, amongst some false English which he has recommended, and much good English which he has reprobated, says, *so-as*, was used by the writers of the last century to express a consequence instead of *so-that*. Swift, I believe, is the last of our good writers who has frequently used this manner of expression." If *that* denote *end* or consequence, the third sense we have assigned to it in the preceding page, and if *as*, on the other hand, signify *similitude* between two objects, *so as* is, as Dr. Lowth states, very improper; while *so that* alone is good English and good sense: and Mr. Tooke is himself guilty of the charge he brings against Lowth, namely, of recommending some false, and reprobating much good English. We cannot help observing that the object of comparison marked by *as* is often implied, and is to be gathered from the context; as in the following stanza:

Save that from yonder ivy-mantled tower,  
The moping owl does to the moon complain  
Of *such as*, wandering near her secret bower,  
Molest her ancient solitary reign.

*i. e.* complain of such persons, as those *who* wandering, &c.

*The Origin and Properties of Verbs.*

We shall begin this part of our subject also with an extract from Mr. Harris, because his opinion, though plausible, is erroneous, and has been the means of leading other

grammarians, who followed his authority, into error. "We are now," says he, "to descend to the common herd of attributes, such as *black* and *white, to write, to speak, to walk, &c.* among which, when compared and opposed to each other, one of the most eminent distinctions appears to be this. Some, by being joined to a proper substantive, make, without farther help, a perfect assertive sentence; while the rest, though otherwise perfect, are in this respect deficient. To explain by an example, when we say *Cicero doquent, Cicero wife*, these are imperfect sentences, though they denote a substance and an attribute. The reason is, that they want an assertion to shew that such attribute appertains to such substance. We must therefore call in the help of an assertion elsewhere, an *is* or *was*, to complete the sentence, *Cicero is wife, Cicero was doquent*. On the contrary, when we say *Cicero writeth, Cicero walketh*, in instances like these there is no such occasion, because the words *writeth* and *speaketh* imply, in their own form, not an attribute only, but assertion likewise. Hence it is they may be resolved the one into *is* and *writing*, the other *is* and *walking*.

"Now all these attributives, which have this complex power of denoting both an attribute and an assertion, make that species of words which grammarians call *verbs*. If we resolve this complex power into its distinct parts, and take the attribute alone, without the assertion, then have we *participles*. All other attributives, besides the two forecited before, are included together in the general name of *adjectives*; and thus it is that all attributives are either verbs, participles, or adjectives. Besides the distinctions above-mentioned, there are others which deserve notice. Some attributes have their essence in motion; such are *to walk, to fly, to strike, to live*. Others have it in the privation of motion; such are *to sleep, to rest, to cease, to die*. And lastly, others have it in subjects which have nothing to do with either motion or its privation; such are the attributes of *great* and *little, white* and *black, swift* and *slow*, and in a word the several *quantities* and *qualities* of all things. Now these last are *adjectives*; those which denote motions or their privation are either *verbs* or *participles*."

"Of all the constituent parts of speech," says the writer in the Encyclop. Britannica, 58, "none has given the grammarians greater trouble than the verb. The vast variety of circumstances which it blends together in one word, throws very considerable difficulties in the way of him who attempts to analyse it and ascertain its nature; at the same time that by its eminent use in language, it is entitled to all the attention which can be bestowed upon it. It should seem that the first object of our investigation ought to be the *characteristic* of the verb, or that which all these words have in common, and which constitutes them verbs, distinguishing them from every other species of words. Now it is obvious to the slightest attention, that every verb, whether active, passive, or neuter, may be resolved into the substantive verb *is*, and another *attributive*: for *loveth* is of the same import as *is loving*; and *amans* with *amans est*."

"But *loving* and *amans* are not verbs; whence it follows that the characteristic of the verb, that which constitutes it what it is, and cannot be expressed by other words, must be that which is signified by the word *is*; and to us that appears to be neither more nor less than *assertion*."

"Assertion therefore, or predication, is certainly the very essence of the verb, as being that part of its office, and that part only, which cannot be discharged by other kinds of words. Every other circumstance which the verb includes, such as *attribute, mod., time, &c.* it may be possible to express by adjectives, participles, and adverbs; but without a verb it is impossible to *predicate, to affirm, or deny*."

any one thing of any other thing. The office of the verb, when stripped of all accidental circumstances, seems to be merely this: to join together the subject and predicate of a proposition; its powers are analogous to those of the sign + in algebra, which does not affect the separate value of the quantities between which it is placed, but only indicates their union or coalescence." The writer then, in illustration of this theory, takes the examples used by Mr. Harris, and then adds, "in resolving every verb, whether active, passive, or neuter, into the substantive verb *is*, and another attributive, we have the honour to agree with all the grammarians."

We respect the opinion of other grammarians, and that of this writer in particular, but we cannot think it an honour to agree with him and his predecessors on this subject; but we rather think it an honour to differ with them, because we conceive them to be in an error. Now the most sure way to ascertain the characteristic of a verb; or that which constitutes its essence, is to attend to that operation of the human mind by which verbs have been formed. But as the affirmative *is* is thought essential to all others, we shall begin with this. And Mr. Harris thus explains it, p 88, "Previous to every possible attribute, whatever a thing may be, whether black or white, square or round, wife or eloquent, writing or thinking, it must first of necessity exist, before it can possibly be any thing else. For existence may be considered as an *universal genus*, to which all things, of all kinds, are at all times to be referred. The verbs, therefore, which denote it, claim precedence of all others, as being essential to the very being of every proposition, in which they may still be found either expressed or by implication; expressed, as when we say "the sun is bright;" by implication, as when we say "the sun rises;" which means, when resolved, "the sun is rising."

According to this explanation *existence* is the primary idea of *is*; and Mr. Harris is little consistent with himself when, in resolving active verbs into this and another attributive, he supposes it to mean *assertion*. But let us deduce a more adequate idea of it from examples—*God is good; His food was locusts and wild boney; If we be virtuous we shall be happy.* In the first of these examples *is* connects *good* with *God*; so in the second *was* connects *locusts and wild boney* with *food*, and asserts, that with regard to John they were the same. In the third instance, *happy* is, by *shall be*, represented a quality of *we*. For this reason the following terms would be more appropriate than any other. The leading noun the *subject*, the thing connected the *predicate*, and the verb connecting them the *connecting verb*. Thus, *God* is the subject, *is* the connecting verb, and *good* the predicate; and so in all other instances.

If then *is* be the characteristic or essential idea of every verb, and if farther, as appears from fact, the primary idea of *is* denotes *connection*, it follows that not *assertion*, as the grammarians have hitherto supposed, but *connection*, is that which constitutes verbs, or that which distinguishes them from other species of words. But the connecting verb itself will not appear necessary, if we judge of its use in the ancient languages, the juxtaposition of the subject and predicate being sufficient to supply its place. Thus *μακαριοι εις ελεησεις*, *blest the merciful*. Here *μακαριοι*, being placed by the side of *εις ελεησεις*, suggests that it belongs to it, and by virtue of this suggestion conveys to the mind as full and complete a proposition as though the connecting verb had been inserted. Thus too in Latin, *Homo precipuum opus Dei*, man the principal work of God, meaning man is the principal work of God. Thus also in Hebrew, "And Moses said unto the Lord, I not eloquent, *i. e.* I am not eloquent, Exod. iv. 10. And Moses

said unto God, who I, that I should go unto Pharaoh; and God said, certainly I will be with thee, and this token unto thee, *i. e.* this *shall be* a token unto thee," iii. 11, 12. In this tongue, indeed, the substantive verb is comparatively of rare occurrence, and its place is supplied by the collocation of the terms to be connected, a principle in itself extremely simple, and suggested by the great law of the human mind. In Greek and in Latin its use indeed is more frequent; and it is remarkable that where it does occur, it generally occurs either in the beginning or the end of the clause, and not in the middle, a circumstance which arose from a desire of keeping together words that are related as subject and predicate. Now Mr. Harris and other grammarians, overlooking the force of juxtaposition, and judging of the importance of the substantive verb from its frequent use in modern speech, have hence supposed that it is absolutely necessary to the existence of language, and that no proposition can be communicated without it. And what is more remarkable still, "they have represented a word as essential to a verb, which, so far from being necessary to a verb, is not necessary even to language."

Verbs express the operations or the active qualities of things; and as the growth of words corresponds to the growth of our ideas, it follows that verbs originally were the names of things; but by combining them with the personal pronouns, they became, in consequence of the association of ideas, to express not things, but their operations.

The conversion of nouns into verbs we will illustrate by an example in the Greek tongue. Mr. Jones, in his Grammar of that language, has shewn that the personal terminations of the Greek verbs are but corruptions of the personal pronouns, and all the variations of mood, tense, number, and persons have originated in these six elementary principles, thus:

εγω	ω, I,	ἡμεῖς	ομεν, we,
συ	ει, thou,	ὑμεῖς	ετε, ye,
ὁ	ει, he,	οὗτοι	οισι, they.

Now let these in their corrupted state be annexed to any noun, for instance to *οἶνος*, wine; and we shall have *οἶνο-ω*, wine I; *οἶνο-ει*, wine thou; *οἶνο-ει*, wine he; *οἶνο-ομεν*, wine we; *οἶνο-ετε*, wine ye; *οἶνο-ουσι*, wine they. When the attention of the speaker or hearer was fixed on the first of these combinations, the union of the two words which signified *himself* and *wine* could not fail of bringing to his mind the circumstances which he had *previously experienced or observed* in regard to that liquid; and hence he necessarily recalled the idea of *making or tasting wine, or drinking wine*. Consequently, the two terms thus combined he naturally employed to express one of those notions. A similar process took place with regard to the remaining five combinations. And thus have we in Greek, and other languages, verbs diversified by *six persons*. This extension of the names of things to signify the actions which those things have been observed to perform, is, it is obvious, founded on the law of association, and may be illustrated by many instances in all languages. But the principle is not so clear in any tongue as it is in Hebrew, where the personal pronouns annexed to the verb are preferred with little variation from what they are in their independent state.

In the above, and similar other examples, the agent, and that which is the effect or object of the action, combine to express that action; but in other instances, the name of the agent alone is sufficient to express its operation. Thus, "the ladies *fan* themselves;" "the plummy people *eye* the falling verdure." Now having previously observed the use or action of the *fan*, and learnt in ourselves the *effect* of the eye, being also previously aware that in a simple direct pro-



position, the second usually denotes operation, we should immediately infer that *fan* and *eye* here express not the things meant by them but their active qualities; in other words, our previous associations would instantly convert those nouns into verbs, though we had never seen them so used before.

From this account of the deduction of verbs from nouns and pronouns, we may ascertain their nature and properties. A verb is a word borrowed from a thing to express the action of that thing. It implies connection, the connection of an agent and its object, or more generally the connection of cause and its effect. But this connection is not expressed by an independent word but by the juxtaposition, or the combination into one word of the agent and its object. On the other hand, it does not imply affirmation or assertion, as grammarians have hitherto supposed, because no word expressive of this enters into its composition. The operation of a verb is indeed positive; and therefore that implication which writers on this subject call *assertion* may be considered to belong to it, but this is rather an inference formed by the mind than a property inherent in the verb; and is confined to a certain mood or form of it. We understand the *indicative* to assert, but this assertion is lost in the *imperative*, *subjunctive*, and *infinitive*. So that if *assertion* be essential to a verb, a verb ceases to be a verb in these moods.

A verb implying an abstract idea, and therefore often indefinite and obscure, may be ascertained in regard to its meaning by recurring to the noun from whence it has been derived. This noun, which probably is the name of some sensible object, suggests its *primary sense*, a circumstance of great importance in the construction of a *philosophical dictionary*, a work existing in no language, and much wanted in every language. "The most necessary verbs," says Dr. Crombie in his English grammar, p. 81. in every language, are those, the signification of which is the most extensive, and which would originally be of most general use, such as verbs denoting existence, possession, acting and being acted upon. Of this kind in our language, are the verbs *to be*, *to do*, *to have*."

We will take these, which this grammarian has cited, as examples to illustrate our theory. In the Great Indian language, *baa-o* is *air*, and *air* is the medium of existence; it gave birth to the verbs of *being* in most languages. Hence *bodan* in Persian; *be* in Anglo-Saxon and English; *βίωω* in Greek, and the digammated *vivo* in Latin, and *booy* in Celtic. On the same principle the Hebrew אור, *avor*, *light*, *air*, is the parent of our words *are*, *were*, *was*, and of the Latin *ero*, *eram*. *To do* is to put forth power: and this, with other verbs of the same kind, are borrowed from such objects as put forth their fruits, such as herbs, trees, the earth. Thus, πικρα, *the grass*, gave birth to ποικω, *to produce*. Hence such phrases as ποικω καρποω, *to produce fruit*: δρυς, *is the oak*; and hence δρυω, *to bring forth as the oak*; βεηκος, *the beech*, hence βεηω, *to yield fruit as the beech*; φαραξ, *pharag*, means *a flower*; hence φαραξω or φαραξωω, *to effloresce or fructify*. In Chaldee ארק, *aruk*, is *the earth*; hence in Greek ερκεω, ερκεω, and our verb *work*. In the same way δω, *do*, *to give*, *yield*, is the real source of the English *to do*.

Now, it is very evident that the principle which converted one of these nouns into a verb, is that which converts all other nouns into verbs. If this be the case, Dr. Crombie and other followers of Mr. Horne Tooke are mistaken, when they supposed that the junction of one of these verbs to a noun, caused that noun in process of time to assume the character of a verb. And here we may observe that an infinitive verb, as separated from its agent or subject, is in reality an *abstract noun*. In this state the preposition *to* is prefixed to it, and its use is to be ascertained from its etymology. In Ara-

bic שׁוּב is a verb which signifies motion to a place or object. Hence in Celtic (*atto*, it) became a preposition denoting an *end*, or the point to which motion tended. In passing to Persian it dropped the initial vowel, and in the form of *ta* it denotes, in Persian, the interval in which motion reaches its object, or that object itself, and thus became the parent of our *to*, which it perfectly resembles in sound and sense. *To* then denotes that point of time or place to which motion or action tends, and in which it terminates; and prefixed to an infinitive verb, thus converted by abstraction into a species of verbal nouns, holds it forth as the object to which the preceding verb is directed; thus, *I desire to learn*, *I desire*, and the object or end of that desire is *learn* or *learning*. It commanded me to tell you, he commanded, and the object which that command respects, is, that I should tell you. This explanation appears just, from the circumstance that when the infinitive verb is the immediate subject of action rather than a more remote object to which an action tends, the preposition *to* is dropped; as *I do plow*, i. e. I use the plough, or act the plough.

Let us next see what Mr. Tooke says on this subject. "The preposition *to*," says he, vol. i. p. 353, "is the Gothic substantive *tau*, or *taubs*, i. e. *act*, *effect*, *reject*, *consummation*. Which Gothic substantive is, indeed, itself no other than the first participle *tauid*, or *tauids*, of the verb *taugan*, *agere*. And what is done is *terminated*, *ended*, *finished*. After this derivation, it will not appear in the least mysterious or wonderful that we should, in a peculiar manner in English, prefix this same word *to* to the infinitive of our verbs. For the verbs in English not being distinguished, as in other languages, by a peculiar termination, and it being sometimes impossible to distinguish them by their place, when the old termination of the Anglo-Saxon verbs was dropped, this word *to*, i. e. *ad*, became necessary to be prefixed, in order to distinguish them from nouns, and to invest them with the verbal character. For there is no difference between the noun *love*, and the verb *to love*, but what must be comprized in the prefix *to*." And he goes on, p. 355, "*Do*, the auxiliary verb, as it has been called, is derived from the same root, and is, indeed, the same word as *to*. The difference between a *t* and a *d* is so very small, that an etymologist knows by the practice of languages, and an anatomist by reason of that practice, that, in the derivation of words, it is scarce worth regarding. And, for the same reason that *to* is put before the infinitive, *do* used formerly to be put before such other parts of the verb which likewise were not distinguished from the noun by termination. As we still say—I do love, instead of I love. And I *doth*, or *did* love, instead of I loved. But it is worth our while to observe, that if a distinguishing termination is used, then the distinguishing *do* or *did* must be omitted, the *termination* fulfilling its office. And, therefore, we never find—I *do* loved, or he *doth* loveth. But I did love, he doth love."

It is necessary briefly to expose what we conceive to be the fallacy and absurdity of this reasoning. *To*, in found and sense, is the farthest possible from the Gothic *taugan*, which is only the Greek τειχω, *to fabricate*, the true origin of *to* being the Persian *tau*, which has precisely the same meaning with it. It is altogether unnecessary to prefix the *to*, in order to distinguish the verb from its corresponding noun, because this is done by the context, or the collocation of the verb; and what is most remarkable, when *to* is prefixed, the verb loses its verbal character, and becomes a noun by abstraction. That an infinitive verb has the nature of an abstract noun, is manifest from this. In all languages it may be made the subject or object of discourse; and, in Greek, it admits of the article before it, as nouns do; and in all instances what

ever, an abstract noun, where such exists, may be substituted for it.—I desire to learn, *i. e.* I desire learning.—To excel in learning is honourable, *i. e.* excellence in learning is honourable. So then, according to Mr. Tooke, *to* is put before a verb to distinguish it as a verb when it has ceased to be a verb—when, from a verb, it is become a noun. And the reason why we say *be doth love*, instead of *be doth loveth*, is not that the termination supplies the place of *to*, but because *loveth* and *love* are one a verb, the other a noun, which last does not admit such a termination.

The conversion of *to* into *do*, so as to become a verbal index, is a conceit of this writer, equally unwarrantable. *Do*, as we have shewn, is the identical Latin *do, to give, to place, to produce, or put forth*, where it has such meaning, in the following phrase—*dare operam*, to put forth exertion, *i. e.* to exert, endeavour. And yet Mr. Tooke has been followed and supported by all subsequent grammarians in the above incorrect and inconclusive reasoning. “The form,” says Dr. Crombie, p. 83, “of the infinitive *to love*, is, doubtless, the same as *do love*, thus denoting the simple energy of the emotion, signified by the noun, *d* and *t* being kindred letters, and easily convertible. To love, therefore, means *act love, do love*, the word *do* or *to* investing the noun with a sort of verbal character. The infinitive, then, expresses simply the action or energy of that attribute which is denoted by the verb, un-compounded with the various accidents of mood, tense, number, and person.” This last sentence is a just description of the infinitive mood which Dr. Lowth very properly calls the *substantive mood*; and it is a correct description of an abstract verbal noun. How then can *to* or *do* invest the noun with a sort of verbal character; when, if it be an index of any thing, it is an index of a verb changed into a noun? A respectable writer on grammar, in the New British Encyclopædia, p. 31, following the track which Horne Tooke has pointed out, thus adds: “The infinitive mood, as it is commonly called, is the verb divested of its peculiar force, *viz.* of affirmation, and un-compounded with those words which render it expressive of person, number, &c. and in the modern languages of time: but it seems erroneous to consider this as the fundamental form of the verb, where it has any distinguishing termination; it is then the *noun state* of the word, with a termination added to it, to shew that it is to be employed as a verb. Thus, in the Anglo-Saxon *thcan, the* is the fundamental form of the verb, and *an* is the *verbalizing adjunct*. Now, as the imperative form of the verb is nothing more or less than the simple verbal name, unattended with the inference of affirmation, this may be considered the fundamental form: and in the Latin in particular the variations of flexion are traced with the greatest advantage from this source.”

It is curious to observe the contradictions and absurdities into which writers plunge themselves, when they have adopted erroneous positions to account for the phenomena of language. Mr. Tooke, assenting to the ancient Stoics, thinks the purest state of the verb to be the infinitive, and yet agrees with his followers in making *affirmation* or *assertion* to be the essence of a verb. But it is allowed that a verb drops its affirmation in the infinitive; so that, according to this reasoning, a verb is in its purest state when without its essence. Again, the infinitive is here not improperly called the *noun state, i. e.* an abstract noun, with the prefix *to* in our tongue; but in the Anglo-Saxon with the affix *an*, to shew that it is a verb: and as this is a new idea, *an*, in a new language, is called the *verbalizing adjunct*. But what evidence is there for saying that *an* performs this office? No evidence at all, but a false assumption. We have already said that the Gothic and Anglo-Saxon *an* is but the Greek in-

finite *an*, or (in verbs in *an*), *an*, which is the same without the change of a letter. We have this further evidence of the derivation of the Northern language from the Greek, in this respect, that in this latter the imperative, instead of being the fundamental form of the verb, is, by corruption, derived from the infinitive. Thus,  $\gamma\epsilon\gamma\alpha\tau\epsilon\upsilon$  was the old infinitive;  $\gamma\epsilon\gamma\alpha\tau\epsilon\upsilon$  was also the imperative; but the final *v* being, by degrees, dropped, it became  $\gamma\epsilon\gamma\alpha\tau\epsilon$ . And it is remarkable, that in the Anglo-Saxon the imperative is derived from the infinitive, in the same manner precisely as the imperative is from the infinitive in Greek; and this correspondence, added to the identity of the termination, we deem a sufficient proof that the Northern, in this respect, is no other than the Greek tongue. The Latin imperative is borrowed from the Greek, as is evident on inspection;— $\gamma\epsilon\gamma\alpha\tau\epsilon$ ;  $\gamma\epsilon\gamma\alpha\tau\epsilon\upsilon$ ; *scribe, scribeto*. And the position, that the variations of inflexion may be traced with advantage from the Latin imperative, is a fancy, which is contradicted by that broad analogy by which the Latin verbs are formed from the present tense. It is worthy of remark, that the old Greek accords with the Hebrew, where the imperative is the same with the infinitive, and succeeds it in the paradigm of verbs. We shall only, on this subject, express our surprize that, if these sensible men were deceived by adopting the notions of Mr. Tooke, they were not repelled by what appear to us to be contradictions. This grammarian gravely tells us that deliberate art had no concern in the formation of language: yet, in examining its phenomena, he recurs to minute mechanism and petty artifices, which, as being unwilling to allow the agency of a rational law in the human mind, he calls the *contrivances of language*.

We now proceed to consider briefly the usual divisions of verbs into *active, passive, and neuter*: and this division of verbs we pronounce to be extremely unphilosophical. And first, as the expression of active qualities is essential to verbs, there is no such thing as a *neuter verb*. There are, indeed, verbs which denote *rest*, or the cessation of *motion*; but we cannot use even these without connecting with them positive ideas: and as action is necessary to destroy or support action, we can resolve all apparent neuter into active verbs. Thus *to stand, is to cause to stop; to sleep, is to enjoy repose; to sit, is to hold one's seat*. Secondly, the division of verbs into active and passive, though convenient in some languages, is incorrect and even absurd in our own tongue. For all active verbs imply passion; while all passive verbs on the other hand imply action. Hence the one may assume the form of the other without altering its nature. Thus, *ille amat parentes, he loves his parents, is the same in sense as parentes amantur ab illo, his parents are loved by him*. The only difference is that, in the first instance, the agent is nominative, and the object accusative: in the second, the object, becoming the subject of the verb, is put in the nominative, and the agent in the ablative. An agent, while it acts, is acted upon. Every active verb, therefore, has the compound sense of active and passive. Thus, in the above sentence, *he loves his parents*, the first part, *he loves*, is active; the last, *loves his parents*, is passive. In the same sentence, converted into the passive form, *his parents are loved by him*: the first part is passive, and the last active. In the infancy of language, the distinction of active and passive was in all probability not known. In Hebrew, the difference but imperfectly exists, and in the early periods of it probably did not exist at all. In Arabic, the only distinction which obtains, arises from the vowel points, a late invention, compared with the antiquity of that language. And in our own tongue the names of active and passive would have been unknown, if they had not been imported from the Greek and

Latin grammars. In English the passive form of the verb is expressed by the connecting verb *to be*, and the perfect participle; and in converting an active into a passive proposition, we need only change the verb to its perfect participle, and subjoin it to the connecting verb in the same mood and tense, and annexing the agent with its correspondent preposition in the ablative case. Thus, we worship God, becomes *God is worshipped by us*. Hence it appears that verbs which are transitively active can be made passive, because they have an object, which, in the passive form, is made the subject of discourse; and that verbs intransitively active cannot have a passive form, because they have no object.

The passive voice, in all languages, is expressed by the connecting verb, and the perfect participle for its predicate; and it is curious to observe, that this combination is its origin in the Greek tongue, the subject of discourse being combined with the personal pronouns in the dative case. Thus, *οικος μου*, *house for me*, which do not, as before, coalesce as a subject with an agent; but as a subject with the person to whom it belongs, and for whom it was intended. Hence their combination came to convey the idea *I am housed, I am built*: for the auxiliary *am* serves only to assert that *housed* or *built* belongs to the pronoun preceding it, and to cement their union in the mind as subject and predicate. In the same manner, if *ου*, *τοι*, be annexed to the word *οικος*, we have *οικος ου*, *οικος τοι*, *house for thee*, *house for him*. And these contractions, by slight changes, became *οικισουμι*, *οικισου*, *I am built, thou art built, he is built*.

A verb, if its operation pass over to another thing, or if it have an object to express the effect of that operation, may be called *transitive*; but if its influence do not pass over, or if it have no object, it is *intransitive*. Verbs, on the other hand, not expressing action, but *being, positure, continuance*, and serving to associate two things, as a subject and predicate, may with propriety be called *connecting verbs*. Of this class is *am*, with all its branches, or the corresponding verbs in Latin and Greek. And here it is proper to observe that verbs of motion came in all languages to signify *continuance, positure*, and the like, because we can measure *duration*, or even *rest*, and privation of motion, only by ideas consequent on motion. Thus, in our own tongue, "a diligent boy will become a learned man." "By thee disposed into congenial soil, stands each attractive plant," *i. e.* *is disposed*. So in Latin, "Quam placidum ventis flaret mare," when the sea stood (*i. e.* *was continued*) tranquil from the winds. Veniet lenior, she will come milder, *i. e.* will *be* or *become* milder. Vixisset immundus fus, he would have lived, *i. e.* he would have become a filthy pig. Ego incedo regina, I walk a queen, *i. e.* I am a queen. Theocritus, speaking of the irascibility of Pan, writes *και ει αυθημερα χολα ποτι ην αυθημερα*, *keen anger always sits in his nose, i. e.* the breath of anger always continues in his nostrils, or, he is ever irascible. On this principle it is that *εχ*, in Greek, as implying continuance or positure, came to have the sense of *am*—*εχω εχ*, *I am well*; and that *εω*, *I am*, and *εω*, *I go*, were originally the same. And in Latin *eo* became, for a similar reason, into *esco*, which occurs in Lucretius in the sense of *est*. From *exire* the Italians have derived *uscire*, to go out, end, and *uscio*, *exitus*, a door, or avenue. Hence we have derived to *usher*. The Italian *stato*, *been*, owes its derivation from *sto*, to the same mode of thinking. All verbs, then, are either transitive or intransitive, or connecting verbs. And this division appears to us obvious, useful, and philosophical.

The properties of verbs are mood, tense, number, and person. On these properties, as they are discussed in all grammars, (see L. Murray's valuable Grammar of the English Tongue; Dr. Crombie on Etymology and Syntax;

Dr. Priestley's Philosophical Grammar, and particularly Mr. Pickbourn's excellent Dissertation on the English Verb,) we shall content ourselves with a few observations. Mr. Tooke, vol. ii 473, says that mood, tense, number and person are no parts of the verb. But this opinion will appear to be erroneous, if we reflect on the manner in which verbs are derived from nouns. For the personal pronouns in each number enter into the composition of a verb in the ancient languages, where it is distinguished by personal termination; though we acknowledge the assertion to be just in English, where the verb is known only from the annexed pronoun, or its connection with the agent and object. Again, if we reflect on a verb in its formation, we perceive it to contain an idea, the result of observation and experience, which, as *pass*, is *certain, absolute, and unconditional*. This *certain, absolute, and unconditional* form is essential to the verb, and it constitutes that *mode* or *manner* called the indicative mood. As the indicative mood respects the past time; *is* the subjunctive, in respect to it, regards the future. And as all future events, at least with respect to man, are *uncertain, relative, and conditional*, all verbs, expressing an uncertain, relative, or conditional sense, are in the *subjunctive*, so called from its being *subjoined* to a verb in the indicative. All verbs, moreover, expressing an *end* or *intention*, as being from their nature uncertain, are used in the subjunctive; and for this reason it might be called the *final mood*. In this view it has a close affinity to the *infinitive*, which, as we have already observed, is only an abstract noun with the preposition *to*, denoting the end or object to which the preceding verb is directed. Accordingly, they may be substituted one for the other, in all instances. Thus, *I desire to learn*; I desire, the object of my desire being learning; I desire that I should learn; I desire, *that* being my end, I should learn. Hence it follows that the subjunctive mood is not essential to language, and for this reason it does not exist in Hebrew and some other tongues. As a command is necessarily given in the time *now*, the imperative has no tense but the present, nor can it, in strict propriety, have a first person, singular or plural; because it would be absurd in a person to command himself. *Let me love*, then, is not the *first* but the *second* person, as may appear by substituting *permit* for its equivalent *let*, *Permit thou me to love*.

Finally, if we reflect on the verb in its element, we shall find that *time past* is essential to it, because the conversion of a noun and the annexed pronoun into a verb is in consequence of past experience or observation. But as present feeling or consciousness coalesces with our reflection on the past, the verb, which owes its existence to the past, comes to signify also the present. And this is the reason why in Hebrew, the most ancient language, the same form of the verb expresses the past and the present time; and it is, too, appears to be the reason why in English and all other languages a verb in the present tense is often used, in an extended sense, to comprehend all time, present and past. *As, the sun rises every day; birds fly; truth is always one*. In these and similar instances no reference is made to the *future*; unless the future, by association, insensibly in our minds coalesces with the past. But men soon became sensible of the necessity of limiting the verb in regard to time. They soon acquired a distinct notion of the three divisions of time into present, past, and future; and in order to vary the terminations of the verb, so as to correspond to these divisions, nothing more was necessary than to follow the impulse of association acting on accidental corruptions. Hence the origin of tenses, which, as the word implies, are the *extension* of the verb by distinguishing terminations to express the divisions of time. And here we cannot help observing, how improper it is to call tenses,

and similar contrivances. *abbreviations*, (as is done by Mr. Tooke,) a name, the very reverse of what a tense purports to be. The formation of the tenses in Hebrew is worthy of attention, and shews that the human mind, under the influence of a rational law, without perhaps the express exertion of reason, may produce a contrivance for its beauty and simplicity truly admirable. In that language the distinguishing termination is the personal pronoun, annexed or prefixed. Now, suppose תי, *ti*, a fragment of the first personal pronoun, to mean *I*. It will also become a natural index of the time *now*, whenever the speaker uses it in connection with a verb, because he measures the present moment by the use of it, or by reflecting on himself when using it. This being the case, a verb preceding תי will be a past verb, by pointing, as it were, the attention backward, as *Pegod-ti, visited I, or I visited*; while a verb succeeding the same particle expresses the *future* time; the pronoun, being the index of the present time, points now the attention forward, as *ti-pegod, I visit, (meaning I will visit)*. But for *tia*, the other fragment of the personal pronoun, is used *apegod*. In modern languages which have no distinguishing terminations, the notification of time future is but an inference drawn from verbs of volition or desire, in consequence of the constant association of the object of that volition or desire with time to come: as *I will learn*, which meant, at first, *I am resolved to learn*, and then the time when the resolution is to be performed. Thus *shall* and *will*, which are the Hebrew שאל, *shaal*, and the Greek βουλα, *volo*, in a secondary sense become indices of time to come. It is here of importance to remark, that though *shall, will*, with *do, may, have, &c.* are called auxiliaries, they are still leading verbs, and govern those, which they are supposed to subserve, in the infinitive mood.

The Greek has been represented as very like the Shanherit; but in truth, the old *Aeolic* dialect, whence the Latin is derived, claims a much closer affinity with the great Indian language; and in that dialect of it which is spoken in Bengal, the mark of the future tense is *bo*. Thus *hoibo, I shall be*, is the future of *bona*; just so is the Latin *amabo*, the future of *amo*; *abo* being originally *αβο*, a form of the verb denoting *causative*, and thence *succession*, or transition in regard to time. Mr. Tooke, indeed, in his usual manner, supposes *amabo* to be an abbreviation of *amaboule, amaboul, amabo*, see vol. ii. 434. But the primary sense of βουλω is *to will, or deliberate*; and upon the same principle that this verb became an index of future time, any other verb or form of a verb would be made an index of it by associating its object with futurity. The ideas which this grammarian had of language are altogether mechanical; and by rejecting the principle of mind, while continually hunting after blind mechanism, he seems to us not to have sustained the character of a philosopher in explaining its phenomena.

*The Origin and Properties of Participles.*

Mr. Harris's account of participles is as follows: Every complete verb is expressive of an *attribute of time*, and of an *assertion*. Now if we take away the assertion, and thus destroy the verb, there will remain the attribute and the time, which make the essence of a *participle*, p. 184. This statement has conciseness and simplicity to recommend it, though we do not regard it as correct. Mr. Tooke gives us the following account of participles. "This sort of word is by no means the same with a *noun adjective*. The participle has all that a noun adjective has; and for the same reason, *viz.* for the purpose of *adjection*. But it has likewise something more than a noun adjective has; because the *verb* has some-

thing more than the noun. And that something more (as Perizonius proceeds to assert) is not only the adsignification of time, for every verb has a signification of its own, distinct from *manner* and *time*. And language has as much occasion to *adjective* the distinct signification of the verb, and to adjective also the *mood*, as it has to adjective the time. And it has, therefore, *adjectived* all three—the distinct signification of the simple verb, and the verb with its moods, and the verb with its tenses. I shall at present notice only six of these verb-adjectives, which we now employ in English, *viz.* the simple verb, itself adjective; two adjective tenses, and three adjective-moods.

"We had formerly in English only the simple *verb-adjective*, and the past tense adjective. In addition to these two, we have now the convenience of four others, which I must call the *potential mood active adjective*; the *potential mood passive adjective*; the *official mood passive adjective*; and the *future tense active adjective*. As the noun adjective always signifies *all* that the unadjectived noun signifies, and no more, except the circumstances of adjection; so must the verb adjective signify *all* that the unadjectived verb signifies, and no more, except the circumstance of adjection. But it has been usual to suppose, that with the indicative mood, as it is called, is conjoined also the signification of the present time, and, therefore, to call it the indicative mood present tense. And if it were so, then indeed the word we are considering, besides the signification of the verb, must likewise adsignify some manner and the present time; for it would be then the present tense adjective as well as the indicative mood adjective. But I deny it to be either. I deny that the present time, or any time, or any *manner*, is signified by that which is called improperly the indicative mood present tense. And, therefore, its proper name is merely the verb—*indicative*, if you please, *i. e.* *indicative* of being merely a verb."

Our readers, we are sure, will not be able to peruse this account without surprise; and we shall endeavour to set it aside by a more simple and rational account of the participle. The *present participle* denotes the operation of a verb without regard to any agent; the *perfect participle* denotes the state, power, or habit, generated by that operation in a person or thing which is the object of it. If this statement be just, the participle in its genuine state is rather a verbal *noun* than a verbal *adjective*, and has a close affinity to the infinitive mood. Hence, we can account for the origin and use of the participle. The Hebrew, and more especially the Arabic, form their verbal nouns by what is called *nunation*, or the syllable *on* added to the verb; and this is the Greek participle in *ων*, which the Latins have converted into *ens*; but which we, by giving *n* a nasal sound, have corrupted into *ing*.

As the participle is a verbal noun, we see the reason why in all languages it is either used as a noun, or gives birth to various classes of abstract nouns. The present participle, as expressing an operation, naturally coalesces with an agent, and this is the reason why in Hebrew, in Greek, and sometimes in Latin, it denotes a doer, or a person who acts; as *ὁ γράφων, he writing, the writer*; *αμάνς, he loving, the lover*. From its facility to coalesce with a noun, the participle loses its nominal character, and becomes an *adjective*; and as it denotes an active quality, or a power in energy, it forms, with the connecting verb *to be*, the three active compound tenses—*I am writing—he was writing—they shall be writing*.

Farther, as all operations are in *time*, and we acquire the idea of time present by reflecting on successive operations, the present participle implies *time* unlimited, and in its associated

ciated effect *time present*, i. e. time present, not absolute, but *relative*. Thus, *I am writing*, i. e. I am *now* writing; I was writing, i. e. I was writing *at the time then* present. And, in general, the participle is defined by the concomitant verb in the sentence which may be either present, past, or future. If the verb be past, it marks the past time as then present; if future, it marks the future as hereafter present. And thus is refuted the opinion of Mr. Tooke, that there is no *assignation of time* in the present participle. But as he may pronounce this argument a mere evasion, I will illustrate it by a parallel instance in Greek. The subjunctive verb *τολεω, τολερι, &c.* is thought to be the *first aorist*; but it is really the *first future*, and this is proved by its signification as well as by analogy, for in all instances this expresses a *future* time, not indeed absolutely so, but future in regard to another verb connected with it in the sentence. For example, "and they asked him, saying, if it be lawful to heal on the sabbath-day, that they might accuse him," *ηνα κατην, ηνα ερω.* To accuse him was their end in asking, and in regard to that act was *future*, though now long past. Finally, things which act in consequence of acting, acquire a *disposition* to act, just as bodies when moved have a tendency to move. Repetition, moreover, imparts to the acting quality additional strength, protension, and permanence. To express it with the propensity and vigour thus attained by use the participial termination *ων* in Greek is added to a noun or to an adjective, which, as receiving an additional meaning, is called an *augmentative*. Thus, *αγορευων*, speaking, means also one who is prone to speak, which is the character of the scoffer or dissembler; *απατωων*, deceiving, one given to deception, a great deceiver; *αυξων*, more wicked, increasing in wickedness. And from this the Italians have derived one way of augmenting their nouns. Hence, our *saloon*, (a great hall), *balloon*, and, perhaps, *poltroon*, the augmentative of *paltry*.

The perfect, or past participle, is certainly derived, as Mr. Tooke represents, from the past tense.—*Amarit*, *amaritus*, *amatus*;—*docuit*, *docuitus*, *doctus*;—*legit*, *legitus*, *lectus*, *lectus*;—*audivit*, *audivitus*, *auditus*. *Us*, which is the Greek *ου*, is added to the third person as the analogical termination of nouns, to shew that the verb is now abstracted into a verbal noun, denoting the effect of the action. Accordingly *amatus*, *doctus*, *lectus*, *auditus*, and the like, are every one either abstract nouns of the fourth declension, or verbal adjectives coalescing with another noun. And here we shall quote a passage from the *Encyclopædia Britannica*, (p. 86.) to shew into what errors grammarians have fallen, by not having attended to the *nominal character* of the participle: "From these observations and examples," says the writer, "we shall be able to understand the two uses of the adjective. It is either employed to *restrict* or *modify* a general term; or the abstract substantive contained in the adjective is modified by the noun with which, in the concrete or adjective form, that abstract substantive is joined. The first may be called the *direct*, the second the *inverse* acceptance of adjectives. Livy, speaking of the abolition of the regal authority at Rome, says; "Regnum est Romæ ab urbe *condita* ad *liberatam* annos ducentos quadraginta quatuor;" Monarchy subsisted at Rome, *not* from the city built (which would convey no meaning,) but *from the building* of the city, to its deliverance. Both the participles *condita* and *liberatam* are here used inversely, i. e. the abstract substantives contained in *condita* and *liberatam* are modified and restricted by the substantives *urbe* and *urbem*, with which they unite. Again, Ovid, speaking of the contest between Ajax and Ulysses for the arms of Achilles, has these lines:

"Qui licet eloquio fidum quoque Nestora vincat  
Haud tamen efficiet, desertum ut Nestora crimen  
Nullum esse reor."

Here also the adjective or participle *desertum* is taken inversely, and the general notion of *desertion* contained in it is modified or rendered particular, by being joined with the substantive *Nestora*. The meaning of the passage is, "I will never be induced to believe, that the desertion of Nestor was not a crime." Were *desertum* to be taken directly as an adjective, modifying its substantive, the sentence must be translated, "I cannot believe that Nestor deserted was not a crime." But it is evident that this is nonsense; as Nestor, whether deserted or not deserted, could not be a crime.

This writer was led by Mr. H. Tooke to consider every adjective as a noun in its nature: he then makes a discovery in which he seemingly blames himself, which is this: instead of the adjective qualifying its noun; the noun inversely qualifies its adjective! This able writer would not have used this language, if he had trusted to his own understanding, and had not allowed himself to be misled by his guide. The participles *condita* and *liberatam*, though they here coalesce with another noun, still retain their original character of a substantive, and the historian has apprized his reader of this character by the *collocation*, where *condita* is rendered prominent and emphatic by succeeding the qualified *urbe*. The same observation applies to *desertum Nestora*, which is equivalent to *desertionem Nestoris*.

As the past participle expresses the effect of an operation, it has been called the *passive participle*; but when the subject of an operation is a moral agent, that effect is *habit*, or a voluntary principle of action. And thus it is, that the perfect participle often expresses or implies action; as, *admiratus*, having admired; *locutus*, having spoken. Sometimes in Greek and Latin it conveys a reflex sense; as, *strictus membra*, having prostrated his limbs; *πεπιστευωσμενος*, having the gospel entrusted to me. And lastly, as the perfect participle is derived from a past verb, and, as it signifies an effect already produced, it points to time past; nevertheless, as that effect is a habit or power capable of action, it implies time present, and thus the past participle, comprehending both times, answers to the denomination of *perfect present*.

*The Origin and Properties of Prepositions.*

Mr. Harris defines a preposition to be a part of speech, devoid itself of signification, but so formed, as to unite two words that are significant, and refuse to coalesce or unite of themselves. This definition is undoubtedly erroneous, and has been justly censured by Mr. H. Tooke. We venture, however, to affirm, that the account given by the last-mentioned writer, is by no means such as a philosopher, who accurately understood his subject, would give of prepositions. "As the necessity," says he, vol. 1. p. 319. of the article, or of some equivalent, follows from the impossibility of having in language a distinct name or *particular term* for each particular individual idea; so does the necessity of the *preposition* (or of some equivalent invention) follow from the impossibility of having in language a distinct complex term for each different collection of ideas, which we may have occasion to put together in discourse. The addition or subtraction of any one idea, to or from a collection, makes it a different collection; and there were degrees of impossibility, it is still more impossible, to use in language a different and distinct complex term for each different and distinct collection of ideas, than it is to use a distinct particular term for each particular and individual idea. To supply, therefore, the place of the complex terms which are wanting in a language, is the preposition employ-

ed, by whose aid complex terms are prevented from being infinite or too numerous, and are used only for those collections of ideas which we have most frequently occasion to mention in discourse. And this is obtained in the most simple manner in the world. For having occasion, in communication, to mention a collection of ideas, for which there is no one single complex term in the language, we either take that complex term which includes the greatest number, though not *all* of the ideas we would communicate, or else we take that complex term which includes all, and the fewest *more* than those we would communicate; and then, by the help of the preposition, we either make up the deficiency in the one case, or retrench the superfluity in the other. For instance, "A house *with* a party wall," "A house *without* a party wall." In the first instance, the complex term is deficient. The preposition directs to add what is wanting. In the second instance, the complex term is redundant. The preposition directs to take away what is wanting."

Now this statement appears to us to be more properly descriptive of *conjunctions* than of prepositions, it being made altogether in reference to *with*, which has, in the above instance, only a *conjunctive* sense; as, a house *and* a party wall, *i. e.* a house *add* a party wall, or, as Mr. Tooke explains, *with* a house *join* a party wall. The following we deem a more just representation. Prepositions express the relations of things; and, as our ideas of relations are associated effects, arising from our ideas of things, so the words expressing relations are borrowed from the things related, that is, prepositions originated in nouns and verbs. But we have seen, that the relations of things are also expressed by *cases*. Cases, therefore, and prepositions, have the same meaning; the former, indeed, being no other than the latter combining with nouns, and thus giving them different terminations, bearing distinct senses. The three leading relations we have farther seen expressed by cases, are *beginning*, *instrument* or *medium*, and *end*. Those prepositions, then, which signify *beginning*, require the noun succeeding them to be in the *original* state or position, or, agreeably to the usual language, govern the *genitive* case. Those signifying *instrument* or *medium* govern their dependent nouns in the *instrumental* or *medial*, or, as it is commonly called, the *ablative* case; while those denoting the object or end to which an action or motion relates, to which it tends, and in which it terminates, have their governed nouns in the *final* or *dative* case.

We now proceed to ascertain the meaning of the leading prepositions, by deducing them from their origin. And we shall find that Mr. Tooke, as his ideas are unsatisfactory and unappropriate in regard to the use of prepositions, is mistaken in almost every instance, in respect to the sources in which they originated. And here we must premise, that our ideas of beginning, medium, and end, are so palpable and distinct, and so essential to distinctness in our other conceptions, that they are nearly *coeval* with our ideas of things and of motions; and consequently must have existed in the language of men, as soon as it reached a form deserving of that name. And as we maintain, that all the varieties of human speech which now exist, or have ever existed, are but branches propagated by various causes, (like the human race itself,) from a few parental stems in the one primeval language of mankind; so we maintain, that most prepositions in different languages, are but the same original words, differently corrupted, agreeably to the genius of the people who borrowed them from their ancestors; and that the English prepositions, in particular, are antecedent to Anglo-Saxon and Gothic corruptions, or, as Mr. Tooke would say, *abbreviations*, and originated in oriental words, derived in many instances through the medium of Greek and Latin. The derivation of the con-

junctions and prepositions is, indeed, the most specious part of Mr. Tooke's system; and not only in his own opinion, but in the opinion of the public, he lies so strongly fortified, that no adversary can dislodge him. We shall, however make an attempt for this purpose.

"I imagine, says he, p. 367, that *of* (in the Gothic and Anglo-Saxon *af*) is a fragment of the Gothic and Anglo-Saxon *afara* or *afora*, *posteritas*, *offspring*, that it is a noun substantiva, and means always *consequence*, *offspring*, *succession*, or *follower*." Now as to *afora* it is nothing but the Greek  $\alpha\phi\omicron\upsilon\alpha$ , *produce*, from  $\alpha\phi\omicron\upsilon$ , and the meaning of *of* is quite the reverse of *consequence*, &c. Thus, in the phrase *rays of the sun*, *of* points to the sun as the origin of rays. It means, therefore, *source*, *origin*, and its derivation is  $\alpha\phi\omicron\upsilon$ , *ab*, root, stem,  $\alpha\phi\omicron\upsilon$ , *ab*. The genitive case, which corresponds to *of*, further proves this, *Solis radii*, where *is*, annexed to *sol*, surely does not mean that the sun is a consequence of the rays, but that it is the origin of the rays. The source or cause of a thing is before that thing in the order of nature. Hence, according to the usual arrangement in Latin, the noun in the genitive is put *before* that which proceeded from it, and this is the reason why in English we always say *father's house*, (*father is house*;) and never *house father's*, having copied not only the genitive termination of the third declension, but also the collocation of the noun affected by it. Moreover, not *of* but *after* came from the Gothic *afara*, because this, meaning *offspring*, came also to denote *succession*, or that which comes after those who gave it birth. And in the Gothic it is used as a preposition signifying *past*, *after*, where the *t* is introduced to humour the pronunciation, as  $\delta$  is inserted in  $\alpha\phi\omicron\upsilon\alpha$  for  $\alpha\phi\omicron\upsilon\alpha$ , or  $\alpha\phi\omicron\upsilon\alpha$ .

As *of* means beginning, it has the same sense with *from*; which last Mr. Tooke derives from the Gothic and Anglo-Saxon *frum*, meaning *first*, *beginning*. This may be admitted. But whence did *frum* originate? The Latins, it is well known, converted the Greek termination  $\nu$  into *m*. Thus the accusative  $\nu$  became *im* or *em*; the genitive plural  $\nu\alpha$ , *um*, and the neuter ending  $\nu\iota$ , is also *um* in Latin. On this principle  $\phi\rho\mu\upsilon$  is the parent of *primus*. This last the Goths of Wallachia, where, as Michaelis observes, a Latin colony had been established, and whose language, after thus blending with the Latin, is the only specimen of the Gothic preserved in modern days, have borrowed and corrupted in the form of *frum*, which retains the original sense of *initium*, *principium*. But we are not yet arrived at the origin of the word. The Arabic  $\gamma\eta\beta$ , *phra*, among other meanings, denotes *the head of a family*; which being rendered more general and abstract, gave birth to the Greek  $\phi\rho\mu\upsilon$ ,  $\phi\rho\mu\iota$ , to the Latin *pra*, to *fra* in the Icelandic, Norse, Danish, Swedish, to *fy* in Frisch, and *frae* in Scotch. And thus the Arabic origin of the word accounts for the different forms of *from*, *fra*, *fy*, *frae*, in the Northern dialects, the first being derived through the medium of Greek and Latin; the others immediately from Asia. Mr. Tooke happens to be right in the meaning of *from*, merely because the Gothic corruption of *frum* has correctly retained the original sense of *primus*. He thus illustrates its signification. Figs came from Turkey; lamp falls from cieling; lamp hangs from cieling. Figs came, beginning Turkey, that is, Turkey the place of beginning to come. Lamp falls, beginning cieling; cieling the place of beginning to fall. Lamp hangs, beginning ceiling; ceiling the place of beginning to hang. This explanation is rational and just: but when he adds came is a complex term for one species of motion; falls is a complex term for another species of motion; hangs is a complex term for a species of attachment, though very true, this is nothing to the purpose. *Came*, *falls*, *hangs*, imply each motion or direction,



direction, and *from* points to the origin of the motion or direction in each, without any reference whatever to their peculiar meaning.

To the prepositions *of* and *from*, stand opposed *to*, *till*, and *for*. Mr. Tooke might, with equal propriety, derive *to* from his own name, as derive it from the Gothic *taujan*, to act, which is but the Greek *τεωρεω*, to fabricate. Equally absurd is it to say, that the Latin *ad* is from *adum*. The parent word, as we have seen, is the Arabic *اتا*, *ata*, to move to a thing. In Celtic, the word has preserved its original form (*atto*), in the exact sense of *to*. But in Persian, losing the initial vowel, it became *taa*; whereas, in Latin, retaining the first and dropping the last, it exists under the form of *ad*, and in English under that of *at*. *To* and *at* have a signification corresponding to their kindred origin, the former denoting the object of motion, the latter coalescence with that object after its reaching it. "That *till* should be opposed to *from*, says he, only when we are talking of time, and upon no other occasion, is evident for this reason, *viz.* that *till* is a word compounded of *to* and *while*, *i. e.* *time*. And you will observe, that the coalescence of these two words *to*, *while*, took place in the language long before the present wanton and superfluous use of the article *the*, which, by the prevailing custom of modern speech, is now interpolated. So that when we say, "From morn *till* night," it is no more than if we said, "From morn *to* *time* night." When we say, "From morn *to* night," the word *time* is omitted as unnecessary. So we might say, "From Turkey to the place called England, or to *place* England," p. 363. But *while*, or, as it is in the Anglo-Saxon, *hwile*, does not mean time but a *period*, or *revolution* of time, such as a day, week, &c. and is derived from the Hebrew *גול*, *gul* or *geel*, to revolve, and *year*, or, as our ancestors spelled it, *gear*, is derived from *גור*, *gure*, or in Greek *γυρω*. The Hebrew *geel* is also the parent of our *wheel*. *To* points to a final object either in place or time, while *till*, in strict propriety, is applied to time only, and is derived from *עולה*, *to rise*, and was at first expressive of the rising sun. Thus, "I will wait *till* morning," *i. e.* I will wait the rising morning. As *till* denotes time, rising, or alternation of time, the word is always understood to be followed by some change implied in the context, but never expressed: thus, "We are always insensible of a blessing, *till* (or *until*) we lose it," then, "we are sensible of it," is a clause implied. "They will stay *till* morning;" and they will then depart, is to be understood. *Till* exists in the Cimbric language, and this is an additional proof, that the uncouth composite to *while* is a mere fiction of Mr. Tooke.

Mr. Tooke takes *for* to signify *cause*, as opposed to *of*, signifying consequence, from the Gothic substantive *ferina*, a *cause*, p. 367. He thus illustrates them, I am sick *of* my husband, and *for* my gallant. Love makes her sick *of* and sick *for*. Here *of* and *for* seem almost placed in opposition. At least their effects in the sentence are most evidently different: for by the help of these two prepositions alone, and without the assistance of any other words, the expresses the two contrary affections of loathing and desire. Her disgust was the offspring of her husband, proceeded from her husband. Her gallant was the *cause* of her love. But if her disgust proceeded from her husband, he was the *cause* of her disgust: and *of* and *for*, instead of being opposed to each other, as they certainly are, mean just the same thing, namely, *cause*, and not *cause* and *consequence*. But in truth, the matter is just the reverse of what our grammarian represents. *Of* means *cause* or *origin*, and *for* means *consequence* or *end*. She is sick *of* her husband—she is sick, her husband is the source of it—she is sick *for* her gallant, and the object to which she looks with desire is her gallant. Accord-

ingly, *for* always supposes the attention not directed backwards, as to the cause, but forwards, as to some end; and its etymology is this, *περα*, to pass over, *περ*, or *per*, the medium of passing to an object: the French *pour*, *for*, the object or end to which passage is made. Johnson gives *for* forty-six different meanings. But there is not one instance in which it does not bear a sense deducible from its primary signification of *end* or *object*. Thus, Christ died *for* us; Christ died, *us*, (*i. e.* our redemption,) being the end or object of his death. To fight *for* the public good; to fight, the public good being the end or object of fighting. He does all things *for* the love of virtue. He does all things, the love of virtue being the end or motive of all his actions, and so in all other instances.

*By* (in the Anglo-Saxon *bi*, *be*, *big*, is the imperative of *byth* of the Anglo-Saxon verb *beon*, to be. And our ancestors wrote it indifferently *be* or *by*. So then, according to this, our auxiliary *be* and the preposition *by* are of the same origin: and what analogy in the name of common sense is there between them, excepting the accidental resemblance of sound. Let us apply this etymology to the solution of some example, "He was slain *by* the sword," *i. e.* he was slain *be* a sword, or, "let a sword *be*." We might ask let a sword be what? Mr. Tooke has anticipated the question by saying this preposition is frequently, but not always, used with an abbreviation of construction: *subauditur*, *instrument*, *cause*, *agent*, &c. Really it appears to us surprising, that a man of taste and understanding should write thus. In Hebrew *בא*, *baa*, is *to pass*, and is the parent of *βα* in Greek. In Arabic and Persian it became a preposition, signifying the medium of motion. In this sense it gave birth also to the Latin *via* and to the English *way*, *bye*, and also to the Anglo-Saxon preposition *bi* or *be*, and the English *by*, which last was used by our old writers to signify the interval of time during which motion is continued; as, "By so long a time," *i. e.* for so long a time—By his life, *i. e.* during his life.

Then it came to signify the medium or instrument by which any action in general was performed. He was slain *by* the sword—He was slain, the sword being the medium or instrument of his slaughter. The derivation of *with* from *wyrtan* is no less absurd. What has *with* to do with *wyr*, or, as we have it, *were*? The parent of this verb, which signifies *to exist*, is the Hebrew *אור*, *awar*, light, air, the medium of existence. The Greek *ωρα*, denoting *connection*, *concomitance*, *instrumentality*, has passed into the Anglo-Saxon in the form of *with*, where it is corrupted into *with*, and exists in the same sense in both forms. The letters *m*, *w*, *u*, are of the same organs, and often change one for another. Many Greek words are borrowed from the Hebrew, by changing *מ* into *ו*; as *מלך*, *malal*, is *βασίλευς*, *to rule*; and all the Welsh words borrowed from Latin have *m* corrupted into *w*, *arma arve*; *mare uoc*; *me w*. Instances of this species of corruption occur in Anglo-Saxon and Gothic. Thus, the Gothic *weis* is the Greek *ωμεις*; and hence the Anglo-Saxon, and the English *we*. Even *withan*, from which Mr. Tooke also derives *with*, is only the Latin *mitti*, *to seat*, *to put*. And not *withan*, as he says, but *ga withan* signifies *to join* or *put together*.

"The English preposition *through*, says our author, is no other than the Gothic substantive *dura*, or the Poutonic substantive *thuruh*, and like them means *door*, *gate*, *passage*, p. 334." And he adds in the next passage, "After having seen in what manner the substantive *hoye* became a preposition in the French, you will not wonder to see *door* becoming a preposition in the English; and though in the first place it was more easy for you to see the nature of the French *de*, because having no preposition corresponding to it in English; yet I am persuaded you will not charge this to me as a fan-

taffical or far-fetched etymology, when I have placed before you at one view the words employed to signify the same idea in those languages to which our's has the nearest affinity." After doing this, he adds, "Though it is not in Asia or its confines that we are to seek for the origin of this part of our language, yet is it worth noticing here, that the Greek, to which the Gothic has in many particulars a considerable resemblance, employs the word *εως* for *door*." All this is very specious, and being confidently advanced, it has the aspect of truth, though it be misrepresentation. The preposition *through* exists, as Mr. Tooke has shewn, in all the collateral languages; and it may be observed, what he has not, that there is a guttural annexed to the word in all. Thus in English *through*, Anglo-Saxon *thurh* or *thurh*, Gothic *thurb*, German *durch*, Teutonic *daric* or *darub*, &c. This uniformity in retaining a guttural, shews that a guttural was an original part of the word. And it is no other than the Hebrew  $\text{דָּרַךְ}$ , *darck*, *road*, *passage*, which has given birth not only to this preposition, but to a multitude of other words in all languages. He came *through* Greece, he came, Greece being the *road*, a *passage* of his coming. The genial sun warms *through* the air; the genial sun warms; the *medium* or *passage* by which it does this, is the air. We shall only add on this subject, that the prepositions *doron*, *neath*, *beneath*, exist in the Arabic, with little or no variation, and in the same sense; while *among* is the Persian *mean*, in the *midst*, the same with the Celtic *mezen*. In the Hindoostanic it is founded with a nasal guttural, as if written *meng*, and by the same analogy that *mid* became *amid*; *love*, *above*; *brut*, *about*; *meng* became *among*. The corresponding word in Hebrew is  $\text{בֵּין}$ , *bin* or *been*, which means *separation*, *distinction*, an idea the very reverse of that contained in *mengan*, *to mix*, from which Mr. Tooke derives it. From signifying *separation*, it came to signify the *interval* between two things separated, and hence the Hebrew *bin* (or written with the *numeration binon*) is the parent of the Anglo-Saxon *binon*, *between*, *within*. The Greek  $\text{πρὸς}$ , *to overturn*, is in Latin *verso*, *to turn*, which the Anglo-Saxons have further corrupted into *ward-an*, *to turn to*. Hence, in the form of *ward* it came to signify the object to which the attention is directed; as *eastward*, *i. e. east prospect*. We add only the genealogy of *over*, Anglo-Saxon *ofer*; Greek  $\text{επι}$ ; Hebrew  $\text{עַל}$ , *over*, *to pass over*.

We have already observed, that Mr. Tooke's description of the nature and use of prepositions belongs more properly to the conjunctions. But we ought rather to say that it belongs to neither. Prepositions express the relation of things, and those relations are the same, whether things or the complex names of things are few or many: and the necessity of prepositions arises not from the impossibility of having a distinct complex term for each different collection of ideas, but from the necessity of those ideas we have of things and their operations. It is therefore utterly erroneous to say, that the preposition is employed to supply the place of complex terms. On the other hand, the conjunctions serve to propose or to compare our ideas, to combine or to separate them: and this use is entirely independent of the number or variety of complex terms. If the complex terms of a language be few, they cannot be so few as not to need being separated; and if they be ever so numerous, they cannot be so numerous as not to need being joined in composition. Indeed what Mr. Tooke says on this subject is indistinct, inappropriate, and even nugatory: though some subsequent grammarians have gravely copied his reasoning as oracular wisdom.

The prepositions and conjunctions in English exist in the Anglo-Saxon and Gothic. But this circumstance Mr. Tooke has kept out of sight. He knew it would appear strange to deduce words of this kind from verbs and nouns in the pa-

rent tongue, while the very same words existed in that tongue coeval, and in many instances antecedent to the nouns and verbs represented to be their origin. But whence came those conjunctions and prepositions to the northern language? We have anticipated this question by proofs from fact. These branches of the northern tongue, as the northern tongue itself has done, originated in the oriental languages. The structure of those languages is such, that the verb is the leading part of speech, and not only the subordinate parts, but even the noun is derived from it. This doctrine is inculcated and supported by the most extensive and obvious analogies, and taught in the popular grammar, so that no learner, who has made any progress in them, can be ignorant of the true origin whence those particles including adverbs, prepositions, and conjunctions, are derived. The verbs, from signifying in the Asiatic dialects the *actions* of things, degenerated to express the *relations* and *connections* of those things; and with some necessary variations incidental to sounds, passed into Greek, Latin, and other tongues, in the form of prepositions and conjunctions; and they were thence propagated, with still farther corruptions, into the Gothic, Anglo-Saxon, and other European dialects. Losing much of their primary forms, and changed in signification, European grammarians soon considered them as distinct parts of speech. And much uncertainty, confusion, and obscurity, hung for ages on the subject, till Mr. Tooke rose and dissipated the mist, by asserting their true origin to be nouns and verbs. This he acknowledges, or rather boasts to have been a mere *conjecture* at first: and it has this singular fate, that, while the conjecture itself is perfectly just, almost every instance alleged to support it is erroneous and futile. Having no acquaintance with the oriental tongues, and seemingly little acquaintance with Greek and Latin, but endowed with a powerful mind, as we conceive, under some wrong biases, and actuated by a desire of opening new paths of speculation, he boldly imputes the dignity of an ancient and independent language to oral corruptions, chiefly made by a barbarous people, so late as the dark ages. On some of these corruptions he lays his hands, and holds them forth to the public as the parents of those words which long existed antecedently to those corruptions. This we believe to be a just representation of the question, and our readers will hence be able to appreciate the merits of his system. The following is the table of genealogy, which he gives of the leading conjunctions.

If	} are the imperatives of	Gif	} of their respective verbs	Gifan, <i>to give</i>
An		An		Au-an, <i>to grant</i>
Unless		Onless		Onlessan, <i>to dismiss</i>
Eke		Eac		Eacan, <i>to add</i>
Yet		Get		Gettan, <i>to get</i>
Still		Stell		Stellan, <i>to put</i>
Else		Als		Alesan, <i>to dismiss</i>
Though		Daf		Dafian, <i>to allow</i>
Büt		Bot		Botan, <i>to boot</i>
Büt		Beutan		Beon-utan, <i>to be put</i>
Without		Wyrrhatan		Anan-ad dare conge-
And		An-ad		riem.

We will briefly examine these. Skinner, before Mr. H. Tooke, has derived *gif* from the Anglo-Saxon *gifan*, *dare*; and perhaps this very word is the foundation of his theory, though he has not mentioned (and he may have forgotten) the circumstance which gave birth to his conjecture. It is, however, important to observe, that the use of *gif*, as a preposition, is not of a late origin: for the Anglo-Saxons used it in that sense, and derived it in common with the verb *gifan* from the Hebrew, Arabic, and Persian word  $\text{בָּן}$ , *kaph*, the *plum*

*palm of the hand*. Now the action of the hand is twofold, *to give or to receive*. In the latter sense it has passed into Latin, and produced *capio, capio*, and even *habeo*, meaning *to hold*; in the former it has given birth to the Anglo-Saxon verb *gif*, which signifies the action of the hand in imparting. Our word *keep* is apparently of the same origin, meaning *to hold*. Mr. Tooke observes, that *gin* is used in our Northern countries, and by the Scotch in the sense of *if*, and he justly says, that it is only a contraction of the participle *given*.

*An*, quoted by old authors, means *if*, as in the following lines, cited by Johnson:

“An honest mind and plain: he must speak truth  
An they will take it so; if not, he's plain:”

That is, *if* they will take it so. This Mr. Tooke derives from *anan*, to grant, which is only the Latin *anno*, to assent to; whereas *an* is the Arabic particle  $\text{ان}$ , *an*, which is pronounced as if written *in*, when meaning *if*. We borrowed it from the Gothic, where it is employed, as it is also in Latin, to mark an interrogation. The derivation of *unless*, or, as it was formerly written, *onles*, from *on-les*, seems at first sight not to be disputed. The application of the Anglo-Saxon *onles* does not appear forced; as Troy will be taken, *onles* the palladium be preserved, *i. e.* Troy will be taken, dismiss the palladium be preserved, or, dismiss that circumstance, namely, the preservation of the palladium, and Troy will be taken. And yet we are persuaded that this is not the true interpretation of *unless*. Mr. Tooke is not fair in explaining the words from which he would derive this and other particles; but, in order to answer his own purpose, gives them a meaning which they really do not bear. *On-lesan* is interpreted by *lye, un-lesse* *f. e. un-lesse, solve*, and it has no other meaning; and in this sense it is incapable of solving the difficulty.—“Troy will be taken, *unless* the palladium be preserved,” which is hardly sense. Mr. Tooke acknowledges that the Anglo-Saxon writers have not given us instances of *onles* in a conjunctive sense: “but, instead of it,” adds he, “they frequently employ *nymbe* or *nembe*, which is evidently the imperative *nym* or *nem* of *nymian* or *neman*, to which is subjoined *the, i. e. that*: and *nymbe, take away that*, may very well supply the place of *onles the*, expressed or understood, *dismiss that*. But *nymian* signifies not merely *to take*, but *to take counsel*, it being derived from the Greek  $\nu\omicron\mu\lambda\iota\varsigma$ , to consult or deliberate; while the Latin *nempe* is  $\nu\omicron\mu\omega\ \pi\alpha$ , by law, by right, rightly, truly: *lesse* is a security by law, and *unless*, we conceive, is a corruption of *unlessed, i. e. unprovided, unsecured*. Thus, Troy will be taken, *unless* the palladium be preserved, *i. e.* it being unprovided, or it being not provided, that the palladium be preserved; or, provided that the palladium be not preserved, Troy will be taken. This author adds *les*, the imperative of *lesan*, which has the same meaning with *on-lesan*, is likewise used by old writers instead of *unless*; as, “But will not hide there *les* yourself do bring him.” To this he subjoins, in a note, p. 173, “It is this same imperative *les*, placed at the end of nouns, and coalescing with them, which has given to our language such adjectives as *hopeless, restless, deathless, motionless, &c. i. e.* dismiss hope, rest, death, motion.” But *les*, we think, which, though not in a comparative form, conveys a comparative idea, is the offspring of the Greek  $\lambda\epsilon$ , (as *little* is of  $\lambda\omicron\tau\omicron\varsigma$ ) both signifying *small, slender*. From denoting something minute, it came, as the Latin *minus*, to express *negation*. On this principle, a *les* *unless night*, meant at first not absolutely a night without sleep, but a night having less sleep than is necessary, or less than

usual, though in time it came to convey the idea of *no sleep* at all. *Unless* without hope; *unless* without rest, and we appeal to our reader, whether the derivation which is not more simple and natural than *dismissed* be just. If the derivation be just, *less* or *lest* is not the perfect participle *lessed* of *lesan*, to dismiss, but a contraction of *lessed*, the logical superlative of *less*, and it means the least degree of some consequence that follows the preceding clause; as, “Let them who stand take heed *lest* they fall,” which means, let those who stand take heed; if not, they will fall, and that is the least that may happen.

*Esse, and*, in the Latin *et*, is ultimately derived from the Greek  $\epsilon\tau\tau\epsilon$ , or as it is in Latin *esse*, to increase, though it may come more immediately from *essen*, the Anglo-Saxon offspring of  $\epsilon\tau\tau\epsilon$ . An observation of Mr. Tooke goes certainly to prove the latter, if we can depend on his exactness. “In each language,” says he, “where the imperative is used conjunctively, the conjunction varies as the verb does. In Danish, the conjunction is *og*, and the verb *ager*. In Swedish, the conjunction is *och*, and the verb *aka*. In Dutch, the conjunction is *et*, from the verb *ackan*. In German, the conjunction is *und*, from the verb *ackan*. In Gothic, the conjunction is *and*, and the verb is *aklan*.” This example serves to shew how nearly allied these languages are one to another, and how a large portion of their is derived from the Greek and Latin.

*Let* is assuredly the Anglo-Saxon *let* or *gut, allow, shew*, though Mr. Tooke has referred it to the verb *to get*. This grammarian seems not to have sufficiently studied those analogies by which the genius of a language is formed. The Anglo-Saxon, delighting in guttural's, forms many of its words by prefixing the particle *ge*, or the letter *g*. Thus, *gesfryn, prisen*, is only the Greek  $\tau\epsilon$ , with *ge*; and *gerung* is our *among*. This peculiarity gave birth to the German mode of prefixing *ge* to the perfect participle, and is the principle on which the Greek  $\epsilon\tau$ , in Anglo-Saxon is corrupted into *geta, get, or gut*. The Anglo-Saxon *sellan*, the German *stellen*, the Swedish *ställa*, the Danish *stiller*, originated in the Greek  $\sigma\tau\epsilon\lambda\lambda\epsilon$ , which denoted first *to lay down the sails of a ship*. Hence in the above mentioned modern tongues, it came to signify, *to place, compose, or adjust*: but the general consequence of putting down the sails is to give *stillness* or *tranquillity* to the ship. Hence  $\sigma\tau\alpha\lambda\lambda\epsilon$  gave birth also to the Anglo-Saxon *stilan*, and the English *to still*, and to the conjunction *still*. The Anglo-Saxon and Gothic used it conjunctively in the form of *stille* or *stille*, and its immediate parent undoubtedly is *stellan*, and not *stellan*, as Mr. Tooke would have us believe.

*Else*, with no less certainty, is the Anglo-Saxon *elisa*, the Latin *alias*, and the Greek  $\epsilon\lambda\lambda\omega$ , and has nothing to do with *alesan, to dismiss*, and it means not *exception* or *dismissal*, but a change or difference in the consequence, or in the condition of what is expressed in the preceding clause. Thus, let the derivation be just, *else* it will not be received, *i. e.* otherwise it will not be received: let the derivation be just; if otherwise than just, it will not be received. On Mr. Tooke's principle the solution stands thus: let the derivation be just, *dismiss* it will not be received, an interjection at once unnatural and unmeaning; and in order to avoid the appearance of sense and coherence, he is forced to suppose a clause understood. Let the derivation be just, if the derivation being just, or dismiss that circumstance, it will not be received: see his resolution of such examples in vol. i. p. 247. The conjunction *et*, like *and*, is a modification of the preposition  $\epsilon\tau\tau\epsilon$ , *an* *and*; and may be resolved in the same way as *and* in English.

ἀλλὰ ἵνα καταστῶμαι, I came not to destroy, *but* to fulfil—I came not to destroy, another thing, (*i. e.* I came for another thing,) I came to fulfil.

Mr. Tooke derives *but* from two different words *butan*, to boot, and *butan*, or *be utan*, to be out, or to except, and accordingly assigns the word two different senses, as it is taken from the one or the other. In opposition to this, we maintain that *but* is the Anglo-Saxon *buton*, or *butan*, and has the sense which it bears in that language of *except*, *without*, and no other but this, or one resolvable into this. We farther maintain, that the Anglo-Saxon *buton* is the Arabic and Hebrew בּוּט, *bata*, to cut, which, as it exists in the former with the *numeration*, is *buton*; and the principal idea implied in it is *separation*. With *but* have flowed from the same source *bit*, a morsel separated; *bite*, to separate with the teeth. Let us apply the word thus explained. I saw none but two plants—two plants being separated I saw none, or two planted being excepted or taken away, I saw none.

In such instances as these, the negative is often omitted for the sake of brevity; but it must be supplied before the sentence can be explained. Again, "I have much to say on this subject, *but* I must proceed to another." Mr. Locke observed, that in such instances, *but* intimates a stop of the mind, in the course it was going. *But*, says our grammarian, the truth is, that *but* itself is the farthest of any word in the language from intimating a stop. On the contrary, it intimates something *more*, something to follow. And, therefore, whenever any one in discoursing finishes his words with *but*, the question always follows, but what? p. 205. Now, we hesitate not to say that Locke, though not right, is nearer the truth than Mr. H. Tooke. "I have much to say on this subject, let that however be separated, or that being separated or laid aside, I proceed to another." Here then *but* denotes the *removal* of the thing which already occupied the mind, and the succeeding word or words mark that which is introduced to fill its place. On such a removal the mind naturally looks forward to the introduction of something else; and its expectation in this respect forms no part of the meaning expressed by *but*, but is a habit formed by experience or association. Knott having remarked, that the Catholics prayed, conferred places, and consulted the originals; Chillingworth replies, "you pray, *but* it is not that God would bring you to the true religion, *but* that he would confirm you in your own. You confer places, *but* it is that you may confirm or colour over with plausible disguises your erroneous doctrines; not that you may judge of them and forsake them, if there be reason for it. You consult the originals, *but* you regard them not, when they make against your doctrine or translation." In all these places, *but* does not, as Mr. Tooke asserts, direct something to be *added* or *supplied*, but denotes a separation or removal of something that ought not to be separated or removed. You pray not that God would bring you to the true religion; you pray, motive being apart, that he should confirm you in your own. You confer places, the right object is separated, and you confer them that you may confirm, &c. You consult the originals, and regard them when they make for your doctrine; this regard is separated when they make against your doctrine or translation. Thus, whatever senses may be ascribed to *but*, they are all resolvable into one original signification. Nor have we need with this celebrated grammarian to trace it into two distinct verbs, a thing in itself very improbable and contrary to all analogy, nor would he have adopted so unlikely an hypothesis, if it were not necessary for supporting his system.

On the conjunction *although*, or *though*, we quote the following remark from the learned Dr. Jamieson, in his Etym. Dictionary. "Mr. Tooke derives *though* from the Anglo-Saxon *thafian*, or *thafigan*, to allow. But there is not the same evidence here, as with respect to some other conjunctions illustrated by this acute and ingenious writer. It certainly is no inconsiderable objection to this hypothesis, that it is not supported by analogy in the other northern languages. In Anglo-Saxon, *theab* signifies *though*, Alemannic *thach*, Icelandic *tho*. I shall not argue from Moes G. *thau*, in *thaujaba*, which Junius views as synonymous with *though*; because this seems doubtful. In old English *thab* was written about 1264, see Percy's Reliques, ii. 210. which nearly approaches to the Anglo-Saxon *theab*. Instead of *thoeb* in our oldest MSS. we generally find *thoebt*, *alhoebt*. This might seem allied to the Icelandic *thoebt*, quamvis, which, according to G. Andr. is per syncop. for *tho. at*, from *tho*, licet, et; Lex. p. 266. But it is more probable, that our term is merely Anglo-Saxon *thobie*. Moes G. *thabta*, cogitabat, or the participle part of the verb from which English *think* is derived; as in latter times *provided*, *except*, &c. have been formed. Resolve *alhoebt*, and it literally signifies "all being thought of," or taken into account; which is the very idea given by the conjunction. The Synon in German exhibits some analogy; *dachte*, being the imperfect and participle part of *denken doch*, although, may have been formed from the same verb." Though this etymology be plausible, we do not agree with it, merely because a more just and simple one may be pointed out. *Although* is *though* combined with *all*, as in the verbs *albeit*, *alene*, (for all one), *atene*, at one. And *though* means not *thought*, but *concession* or *allowance*, and is derived from the Greek obsolete *δοω*, to give, to grant; and as this verb is *δοω*, or *δαω*, (which gave birth to the first aorist *ἔδωκα*), so this derived conjunction is *tho* or *though*. Its resolution may thus be illustrated: "Though the book be long and tedious, I will read it with attention: be it granted, that the book be long and tedious, I will read it with attention." It is observable, that in its simple form the word is hardly capable of being explained on Dr. Jamieson's principle. "Be it *thought* that the book is long and tedious, I will read it with attention;" whereas, on our hypothesis, the compound form is easily susceptible of illustration. Be it all granted, that the book, or grant that the book be all long and tedious, &c. It is observable that the word has spread as is seen above, from the same root into all the kindred northern tongues. So has indeed *to think*, but this comes from *ἰσχυρομαι*, to express, which in its derived form was naturally employed to denote the operation of the mind in supplying the materials of discourse, *i. e.* in thinking. The noun *ἰσχυρος* is also the parent of our word *thing*, which signifies any object that is the subject of thought. We only add that the Anglo-Saxon *thafian* is certainly of the same origin with *though*, the guttural *gh* being corrupted into the labial *f* in the orthography, as well as in the pronunciation.

Skinner's account of *and* is this. "Nescio an a Lat. *addere*, q. d. *add* interjecta per epenthesein *n*, ut in *render* a reddendo;" which we think a more proper etymology than that of Mr. Tooke, who derived it from *annu-ad concertium dare*, a combination and a sense of his own invention. But this word exists in Anglo-Saxon and Gothic, not only as a conjunction but as a preposition combined with words. In these characters it signifies *connection*, *union*, *reciprocation*, or *opposition*; and these significations demonstrably shew that its origin is the Greek *ἄντι*, so similar to it in sound, and precisely the same with it in sense. When one person or thing meets another to unite or co-operate, *ἄντι*, expressing  
this

this union, or co-operation, is the copulative *and*; but when a person or thing opposes or counteracts another, *etia*, in the form of *and*, is combined with another word to express *against* or *in return*; as *andwoyrd*, a word in return for a word, *i. e.* *an answer*; *andwells*, against the sun, see Hicks's Anglo-Saxon Grammar, p. 87. When objects act upon the organs of sense, the mind is supposed in return to act upon the impressions of those objects in order to perceive them, and the perception so acquired is called in Greek *συναισθησις*. Hence, in Anglo-Saxon *andwit*, if we attend to the composition of the word, means that sense which the mind acts or acquires by a reciprocal action on its own organs.

The conjunction, according to Mr. Harris and other grammarians, connects not words but sentences, so as out of two to make one sentence. Thus, you and I and Peter rode to London, is one sentence made of three. But this notion Mr. Tooke refutes by the following example: two and two are four, A B and B C and C A form a triangle. John and Jane are a handsome pair. Does A B form a triangle, B C form a triangle? Is John a couple? Is Jane a couple? Are two four? p. 221. In truth, conjunctions as well as prepositions affect words and not sentences, and their office is to combine the words succeeding to the words going before them, *i. e.* to combine a verb coming after with a preceding verb; a noun coming after with a preceding noun, an adjective coming after with a preceding adjective, &c.

Mr. Tooke has not given the etymon of *than*, though it exists only in Anglo-Saxon under the form of *thonne*, and in Gothic under that of *thana*. But in order to come at its origin, we must attend to the effect which external objects produce on the organs of sense. When two qualities, unequal in degree, are compared, that which exceeds appears to receive by means of the contrast an immediate augmentation; while on the other hand, the less seems to diminish. This being the case, and human nature being the same in all ages and countries, the same form of expressing the degrees of comparison has obtained in all languages. Thus in Hebrew *tub mia kberust*, good from gold, *i. e.* better than gold. The Arabs borrowed the Hebrew *min* to express their comparative; and the Persians denote it by *az*, a word of the same import. The Latin tongue in this instance is founded on the same general principle—*Clavio sole*, brighter from the sun. The French *de* and the Italian *di* are taken from the Latin *de*; and as the use of cases in these languages has for the most part given way to prepositions, they express their degrees of comparison by these particles in the sense of *from*. In our own tongue the mode of expressing the comparative seems alone unintelligible. But by tracing *then* to its root the mystery vanishes; and we recognize the same great principle of nature. The imperative of the Hebrew *נָתַן*, *nattan*, which has given birth to corresponding verbs in all other languages, is *תָּן*, *than*, which is precisely our English *than*, retaining not only its original sound, but moreover its original sense of *give*, *put*, *place*. Thus, his face was brighter *than* the sun. *Put* the sun (namely by the side) his face was brighter. Lighter *than* gold. *Put* gold, it is lighter. From the juxtaposition of gold it becomes lighter; or as in other languages lighter *from* gold. I shall only add that *won*, *from*, of the Germans, is a corruption of the Hebrew *מִן*, *min* or *mon*, *m*, *b*, *v*, being interchangeable letters. Accordingly the Germans say in the superlative, der beste *won* seinen brudern, the best *from* his brothers, the best of his brothers.

It still remains that we notice the *adverbs* and *interjections*, but as we have already occupied so much of our readers attention in discussing the other parts of speech, we shall dis-

patch these by one or two general remarks. *Adverbs*, or as Mr. Harris describes them, attributes of a secondary kind, are corruptions from nouns, adjectives, pronouns, and verbs. The name of *adverbs* given to such corruptions is not, it should be observed, descriptive of their nature, as distinct parts of speech, but of their use in modifying the verb or adjective to which they are annexed. An adverb is often a substitute for a whole clause, as *here*, *for in this place*; *then*, *for at that time*. In this view, adverbs are the only words which properly come under the denomination of *abbreviations*, a term of which Mr. Tooke is so fond, and to which he so improperly refers several other parts of speech. As to *interjections*, it may be questioned whether or not they can be considered as *articulate* sounds, though they have been usually honoured with a distinct department in language. One consideration, however, is calculated to leave them in possession of their hitherto enjoyed honours. Interjections, it is true, are not distinct names of our feelings and passions, and therefore they have not, like other words, derived articulation from the association of sense with sound; nevertheless they consist of certain *expressions* or *cries*, which, as founded in nature, are as well calculated to recal to our minds ideas of certain emotions, as if, like other words, they had been by common consent made the signs of those emotions.

GRAMMAR is also used for a book concerning the rules of grammar, which obtain in any language. See LANGUAGE.

The ancient grammars are: for the Hebrew, that of rabbi Juda Ching, which is commonly held the first Hebrew grammar that appeared; though it is certain, rabbi Saadiah Haggaaon, who lived before rabbi Juda, composed two works of the same kind: one expressly of grammar; and the other of the elegancies of the Hebrew tongue.

For the Greek, the oldest grammar is that of Gaza: the Latin ones are the works of Martianus Capella, Priscian, and Alconius Pedianus.

The modern grammars are; 1. For the Hebrew, that of Pagninus, the edition of Hen. Stephens, or le Preux; at Geneva, in 1592; that of Petrus Martinus at Rochel 1592; that of Buxtorf; that of Ludovicus Deus, in three languages; that of Sixtinus Amama, which is a collection from Martinus and Buxtorf; that of Bellarmine, with the notes of Muis; those of F. Sglanther, of W. Schickard, and of Vict. Bythner, to the latter of which is annexed a brief account of the Chaldee, are useful for beginners; and those of Gronovius, Schultens, Schroeder, Bayly, Bennet, Robertson, &c.; and for the Hebrew, without the Massoretic points, the excellent grammar of Mafese, to the second edition of which, published at Paris in 1743, are annexed Chaldee, Syriac, and Samaritan grammars; those of Sharp, Wilson, Bates, Parkhurst, &c. 2. For the Chaldee, the best are those of Martinus, Buxtorf, and Lud. Deus, in three languages. 3. For the Syriac, those of Amira, Myricæus, Waterus, and Beveridge; with the Chaldee and Syriac ones of Buxtorf, of Lud. Deus in three languages, and that of Lemmeden. 4. For the Coptic, the Prodromus Coptus, and Lingua Aegyptiaca Restituta of Kircher. 5. For the Arabic, that of Erpenius, and that of Golius, which is only Erpenius's a little augmented. 6. For the Ethiopic, that of J. Ludolphus. 7. For the Persian, that of Lud. Deus, and that of sir William Jones. 8. For the Sanscrit, those of Wilkins and Carey. 9. For the Armenian, those of Schroeder and Galanus. 10. For the Greek, those of Mart. Rulandus Sylburgius, F Moquet, Vossius, Gaza, Herman, Busby, Port Royal, Manutius, Bell, Milner, Moor, Parkhurst, Valpy, Jones, &c. 11. For the Latin, those of Diomedes, Despanter, the Minerva of Sanctius, those of Vossius, Ward, Clarke, and Sprat; that of Port Royal, which

is only a collection from the rest; those of Lowe, of Eton, of Jones, &c. 12. For the Italian, those of Berger, Lanfredi, Port Royal, and Veneroni. Baretto, &c. 13. For the Spanish, those of Salazar, Port Royal, the abbot de Vairac, &c. 14. For the Portuguese, that of Pereira. 15. For the French, those of the abbé Regnier, and F. Buffier, &c. 16. For the High Dutch, those of Claius, Hertburgensis, Schottelius, Boedicher, and Steinbach. 17. For the German, that of Wendeborn, &c. 18. For the English, those of Wallis, Brightland, Greenwood, Lowth, Prickley, Murray, Cromley, &c.

GRAMMAR is also used in the same sense with elements; as geographical grammar.

GRAMMAR, *Philosophical*, is that which, without regarding the several idioms of particular languages, only respects those principles that are essential to them all. One of this kind was proposed by Lord Bacon; not upon the analogy of words, but such as should diligently examine the analogy or relation between words and things. He disapproves too curious an enquiry about the original imposition and etymology of names. This he thinks an elegant, and, as it were, a waxen subject, that may be handsomely wrought and twisted, but is attended with little truth and advantage. But, says he, it would be a noble kind of grammar, if any one well versed in languages, both the learned and the vulgar, should treat of their various properties, shewing wherein each of them excel and fall short: for thus languages might be enriched by mutual commerce, and one beautiful image of speech, or one grand model of language, for justly expressing the sense of mankind, be formed like the Venus of Apelles, from the excellencies of several. And thus, at the same time, we should have some considerable marks of the genius and manners of people and nations, from their respective languages. See Bacon's Doctrine of Delivery, § 7. and De Augm. Scient. vi. 1.

The object of philosophical or universal grammar is speech or language, as divided into its constituent parts, as a statue may be divided into its several limbs; or else, as resolved into its matter and form, as the same statue may be resolved into its marble and figure: and thus it is distinguished from the art of logic, which considers speech as combined or compounded; so that by this synthesis, simple terms are combined to produce a third, &c. In this kind of grammar, the design is to point out the several powers and modes of expression which sounds are capable of, to trace their connections with, or relation to the ideas they represent; and to shew the actual variety of the external expressions of the same mental conceptions which different languages exhibit. By this comparison we shall be enabled to judge which is the most adequate and convenient method of expression, what is defective and what is redundant in the structure of any particular language, and direct to the most proper method of supplying the defect, or lessening the inconveniences arising from the superfluity. (See LANGUAGE.) See an excellent and well-known work of this kind, by the ingenious and learned Mr. Harris, called the *Hermes*, or a Philosophical Enquiry concerning Universal Grammar, 2d ed. 1765. See also Tooke's *Diversions of Purley*, and the preceding article GRAMMAR.

GRAMMAR, *Characters in*. See CHARACTER.

GRAMMARIAN, GRAMMATICUS, a person well versed in grammar; or who teaches grammar.

The denomination grammarian is, like that of critic, frequently, though unjustly, used as a term of reproach; a mere grammarian; a dry, plodding grammarian, &c. The grammarian is conceived as a person wholly attentive to the minutie of language; industriously employed about words and phrases;

and incapable of perceiving the beauties, the delicacy, finesse, extent, &c. of a sentiment.

Scaliger, however, considered grammarians in another light. "Utinam essem," says he, "bonus grammaticus? fulsicit enim ei, qui omnes auctores probe vult intelligere, esse grammaticum."

The title grammarian, it is certain, was anciently a title of honour; being given not only to such as applied themselves to grammar, or excelled in philology; but to all who were reputed learned in any art or faculty whatever, as is shewn by Ger. Vossius, in his book of grammar.

The word was properly a title of literature and erudition, and was frequently given to persons who excelled in all, or many arts, called also *polybibles*.

Thus, Philoponus, a famous philosopher in Justinian's time, remarkable for the extent and variety of his knowledge, was surnamed *Grammaticus*, as appears from Photius's Bibliothec.

So Saxo, the Danish historian, in the 13th century, got the appellation *grammaticus*: and as late as the year 1580, Thomas d'Averia, a celebrated Neapolitan lawyer, was surnamed the Grammarian.

The title grammarian was anciently bestowed on those we now call critics, men of learning, erudition, letters, &c. and particularly such as wrote well, and politely, in every kind.

It is in this sense that Suetonius intitles his book which he wrote on the best Latin authors, "Of the celebrated Grammarians;" and that Cornelius Nepos calls the commentators on the orators and poets, grammarians; and lastly, it is in this sense the appellation is attributed by the ancients to Apion, Philoponus, and Solinus.

The most celebrated grammarians of the second century were Aper, Pollio, Euty chius, Proculus, Athenæus, Julius Pollux, Macrobius, and Aulus Gellius: the works of these last authors are an assemblage of abundance of very different things, and subjects relating to the criticism of the ancient writers, and the polite literature.

If the name have lost its ancient honour, it is through the fault of those who have assumed it; by their treating of grammar in a low, pedantic, dogmatic manner; reducing it to words and syllables; and dwelling altogether on trifling puerile remarks and censures: whereas its ancient office was to make an accurate and thorough examen of an author; to enter into all his views; to point out the beauties, and the defects thereof; to distinguish the true beauties from the false; and the genuine productions of an author, from the supposititious; that is, a grammarian was then, what we call a critic now.

Those who only taught to read, understand, and explain authors, were called grammatists, grammatiste; in contradistinction from grammatici; though, in course of time, the grammatiste have risen in the place of grammatici, who are now preferred to that of critici.

GRAMMATICAL, something relating to grammar.

We say, grammatical construction; grammatical signification, &c. Idioms, as Anglicisms, Latinisms, Grecisms, Gallicisms, &c. deviate from grammatical strictness. Such a phrase is not grammatically just; it is an idiom.

GRAMMATICAL Criticism. See CRITICISM.

GRAMME, in the new weights of France, is the weight of a centimetre of distilled water at its maximum of density, = 18.8247 French grains = 15.444 English grains = .002263 English avoirdupoise pounds.

This weight is the standard, or unit, of the new system of weights; 10, 100, 1000, and 10,000 times its weight, being expressed by the prefixes, *deca*, *hecto*, *kilo*, and *myria*, respec-



respectively; and  $\frac{1}{100}$  th,  $\frac{1}{1000}$  th, and  $\frac{1}{10000}$  th, by the prefixes *deci*, *centi*, and *milli*. Thus, hectogramme signifies 100 grammes, and centigramme signifies the hundredth part of a gramme.

GRAMMELOUC, in *Nature's History*, the name of an East Indian shrub, very common in the woods and forests. It grows to five or six feet high: its leaves are very long and narrow, and terminate in a point; they are of a lively green: the fruit is carried in a bag of a triangular shape, of the size of a hazel-nut, but something longer; on opening this there appear three cells, in each of which is contained one fruit, resembling the seed of the palma Christi, but covered with a transparent pellicle, and a black one under that: the inside of the fruit is white, and is of a sharp and pungent taste. It is a very violent medicine, operating both by stool and vomit, and that often, so as to endanger the life of the person who has taken it. They allay its operation by eating betel. *Mem. Acad. Par.* 1669.

GRAMMICA, in *Botany*, from  $\gamma\rho\rho\mu\mu\alpha\iota$ , *linear*, alluding to its slender thread-like form. *Lourecq. Cochinch.* 170, appears evidently by his description to be a species of *Cuscuta*, or Dodder. See *CUSCUTA chinensis*, n. 6, which is probably the very plant.

GRAMMITIS, from  $\gamma\rho\rho\mu\mu\alpha\iota$ , a *line*. Swartz. *Fil.* 21. Class and order, *Cryptogamia Filices*: sect. *Annulate*. Nat. Ord. *Filices*.

Ed. Ch. *Capsules* in straight scattered lines. *Cover* none.

This genus differs from *Polypodium*, in having its capsules disposed in straight continued lines, instead of round dots. The *involvernum* is wanting in both. Dr. Swartz defines twelve certain species. Of these such as have a simple undivided frond, like *G. lanceolata*, Swartz. t. 1. f. 4, form the most natural assemblage. The genus has, however, the advantage of admitting some ferns, which preceding writers did not well know how to dispose of, as *G. Ceterach*. (*Asplenium Ceterach*: Linn. Sp. Pl. 1538. *Scolopendrium Ceterach*; Sm. Fl. Brit. 1134. *Engl. Bot.* t. 1244.) and *G. leptophylla*, Swartz. t. 1. f. 6, which Linnæus and other botanists had hesitated whether to reckon a *Polypodium* or an *Asplenium*.

Dr. Swartz mentions two doubtful species; the *Polypodium graminum* of Lamarek, perhaps his own *Grammitis linearis*; and the *Asplenium salsifile*, of Cavanilles lectures, n. 627, a native of the Philippine islands.

GRAMMONT, in *Geography*, a town of France, in the department of the Scheldt, and chief place of a canton, in the district of Audenarde, built at the foot of a mountain by the Goths, and thence called "Gottteghem." When Baldwin de Mons, count of Flanders and Hainaut, purchased the lordship of one Gerard, in 1068, he built a town, calling it after the name of the former lord, Gerardmont; and hence, by corruption, Grammont. It is partly situated on a hill; and the river Dender, which runs through it, divides it into the Higher and Lower Town; 20 miles W. of Brussels. The place contains 5948, and the canton 16,000 inhabitants, on a territory of 92½ kilometres, in 17 communes.

GRAMMUM, a town of Hindoostan, in Myfore; 44 miles N. of Seringapatam.

GRAMPIAN HILLS, a range of mountains, extending from E. to W. through almost the whole breadth of the kingdom, from Lech Lomond to Stonehaven, and deriving their name from one of them, the "Mons Grampius" of Tacitus, where Galgacus waited the approach of Agricola, and where was fought the battle so fatal to the brave Caledonians: This chain of hills forms the southern boundary

of the Highland; though four or five counties on the N.E. of that chain face, in their eastern and northern part, the name of Lowlands. The transition to the Grampian is gradual; the first chain, according to general Roy, consisting of the Sadley hills on the E., the Ochil in the middle, and Campsie-hills on the W. To the Grampian chain belong Ben Lomond, 3262 feet high; Ben Loyal, 3009; Ben More, 3903; Ben Lawers, the chief mountain, 4215; Schellallien, 3561; Ben Vorlich, 3320; and other hills considerable elevation on the east.

GRAMPOUND, a small borough and market town, in the hundred of Powder, and county of Cornwall, England, is situated on the banks of the river Fal or Fal, in the parishes of Creed and St. Probus, the eastern part of the borough being in the former parish, and the western in the latter. Grampound is supposed, by Borlase, to stand on the site of the Voliba of Ptolemy. Extensive privileges were conferred on this town by king Edward I., particularly a freedom from toll throughout Cornwall; and the remains of a Caedufala, or Felon Wood, granted with all the lands in it by this monarch, are still extant. The right of holding a market was a grant from John of Eltham, earl of Cornwall, and brother to Edward III., who, after the death of earl John, confirmed the first charter, and made the town a borough: but no representatives were returned to parliament till the reign of Edward VI. Two members are now elected by the magistrates and inhabitants paying foot and lot; but the whole number of voters is only 25. The corporation consists of a mayor, eight magistrates, a recorder, and a town-clerk. The church is about half a mile from the town, in the parish of Creed; but a small chapel of ease stands near the centre of the borough. Grampound is 263 miles S.W. from London; has three annual fairs, and a weekly market on Saturdays. In the return under the late act, the inhabitants amounted to 525, the houses to 80. *Polwhele's History, &c. of Cornwall. Beauties of England and Wales, vol. ii.*

GRAMPUS, in *Ichthyology*, the DELPHINUS *orca* of Linnæus; which see.

GRAMZOW, in *Geography*, a town of Brandenburg, in the Ucker Mark; 8 miles S.E. of Prenzlau.

GRAN, or ESZRENGON, or *Strigonia*, a town of Hungary, situated near the conflux of the rivers Gran and Danube; the see of an archbishop; 55 miles S.E. of Presburg. N. lat. 47 44'. E. long 18.

GRAN, a small island on the W. side of the gulf of Bothnia. N. lat. 62 1'. E. long. 17 22'.

GRANA, a sea-port of Spain, in Galicia; 2 miles W. of Ferrol. N. lat 43 29'. W. long. 8 15'.

GRANA *Figlia*, in the *Materia Medica*, the fruit of a species of ricinus.

GRANA *Paradis*, or *Greater Cardamom*, are the seeds of the animum of Linnæus.

GRANA *Rgia*, the seeds of the common ricinus, called by some palma Christi.

GRANADA, or GRENADA, sometimes called *Ulla* *Andalusia*, in *Geography*, a kingdom or province of Spain, occupying half of the eastern extremity, and all the southern part of Andalusia as far as the straits of Gibraltar, has the form of a pyramid with its base to the east, on the kingdom of Murcia, and its apex to the south-west towards the Straits. Its length is 58 leagues from the E. to the S.E.; the breadth at its apex seven from the S.W. to the N.E., and at its base 28 from S. to N. To the E. and N.E., it is bounded by the kingdom of Murcia; to the S. and S.E. by the Mediterranean; to the W. by the kingdom of Seville; to the W. and N.W. by that of Cordova;

and to the N.W. and N., by that of Jaen. It lies between 36° 20' and 38° N. lat. and between 5° 5' and 1° 30' W. long.; and contains about 661,600 inhabitants. This province has three sea-ports on the Mediterranean; viz. that of Amunécár, defended by three forts of little importance; that of Almería, which was celebrated under the Arabs; and that of Málaga, now the most flourishing and most frequented. Its principal towns are Granada, the capital, Málaga, Almería, Guadix, Motril, Marbella, Velez-Málaga, Baza, Vera, Ronda, Loja, Santa-Fé, Huelva, Antequera, and Alhama. Its rivers are the Verde, Xenil, Las Feguas, Guadalentia, Guadavar, Guadalmeja, Rio de Almería, Rio Frio, Guadalmerina, Darro, Andaraye, Guadix, Bravata, Marchan, Almarcara, Aguas, Culebras, and Guadalete. This province is very mountainous; its chief mountains being the following, viz. the Sierra Vermella or Vermeja, i. e. red mountain, so called from the colour of the soil, the Sierra de Filabre, the Sierra de Bujo, the Sierra Blanquilla, or white mountain, denominated from its appearance at a distance, and the Sierra de Javal-Cohol. The Sierra Nevada is a grand and beautiful mountain situated nearly in the centre of the province: it takes its name from the snow that remains on it through the year. It is very lofty, can be seen at a very great distance, and is well known to mariners, who discover it far out at sea. The Sierra Alpuxara, likewise in this province, is formed by the contiguity of several lofty mountains, and generally called the Alpuxaras. These afforded a retreat to a considerable number of Moors driven from Granada, who remained there 120 years, till their total expulsion from Spain. The Sierra de Ronda lies on the southern and eastern part of the province of Granada; stretching N. and E. in that of Seville, and running S. towards the straits of Gibraltar. Granada, although mountainous, contains plains of considerable extent, and pleasant valleys abounding in springs.

Granada, as a part of Andalusia, was first known to the Phœnicians and then to the Carthaginians, who were expelled by the Romans; and they also were expelled, in the fifth century of the Christian era, by the Vandals; and the Goths, led by Euric, afterwards took possession of the country. The Arabs entered Spain by Andalusia in the year 711; and after the battle of Xeres, which decided its fate, as well as that of Spain, it belonged to the caliphs of Damascus, and then to those of Bagdad; till at length Abdal-rahman, or Abderame, a prince of the blood-royal of the Omniades or Almohades, seized on the throne of Spain in 755. In the year 1027 the empire of the Moors in Spain was dismembered; and in 1221 the kingdom of Granada was dissolved. Soon after this period, viz. in 1236, Mahomed Almir, or Alhamar, founded anew the kingdom of Granada; and his descendants preserved for about 2½ centuries the throne, which he transmitted to them. It was reserved for Ferdinand V. and Isabella his queen, to give the last blow to the power of the Moors, by depriving them of the kingdom of Granada at the end of the 15th century. The capture of Malaga, Aug. 18th 1487, facilitated the siege of Granada, the capital of the province, into which the Moors had collected their whole force. They were attacked in 1491, and after a siege of upwards of a year, the town was obliged to surrender to the Catholic armies; and thus in 1492 the Moorish empire in Spain terminated. The extent of Granada at this time was 70 leagues long and 30 broad; it contained, as it is said, 32 great towns, 97 smaller ones, upwards of 2000 boroughs and villages, and 3,000,000 of inhabitants. The revenue derived from it amounted annually to 700,000 ducats; and gold and silver abounded more in this kingdom than in any other country of Europe.

But the astonishing fertility and wealth of this country passed away with its old inhabitants, and were succeeded by a deplorable degree of indolence, poverty, and misery.

GRANADA, or *Grenada*, the capital of the province above described, and an archbishop's see, is a large city, which was entirely built by the Moors in the tenth century; and in 1235, after having previously belonged to the dominions of the kings of Cordova, it became the capital of a new empire, and soon acquired great celebrity in the Moorish annals. This town, which in a short time became important for its extent, population, wealth, and power, and the magnificence of its buildings, became, in process of time, the ultimate resource and last bulwark of the authority of the Moors in Spain. We have already given an account of its surrender to the Catholic kings. At that period it was three leagues in circumference, its ramparts were defended by 1030 towers; its walls inclosed 70,000 houses, and a population of 400,000 inhabitants. It had an army of 60,000 men; and the number that defended its ramparts in 1491 and 1492 amounted to 100,000. It was protected by two fortresses, each of which was large enough to contain 40,000 men.

This town stands on two hills, at the end of the plain called Vega de Granada, near the Sierra Nevada, on the banks of the Darro which runs through it, and of the Xenil which bathes its walls. The two fortresses just mentioned are on the summits of the hills on either side, thus commanding the town, which itself commands the beautiful adjacent country ten leagues round; and its situation is delightful. The plain, at the extremity of which it stands, is somewhat sloping; its diameter is from nine to ten leagues, and its circumference 30: on the N. it is bounded by the Sierra Nevada and the mountains of Elvira, and on the other sides by successive and varied amphitheatres of hills agreeably planted with vines, olives, mulberry, lemon, and orange trees, &c.; it is watered by five rivers, intersected by various canals, supplied from limpid rivulets with a number of springs; and it is covered with meadows, forests of oak, woods of orange-trees, orchards, sugar-canes, corn, flax, and in short all kinds of fruits and vegetables.

Granada was formerly divided into four quarters, viz. Granada, Alhambra, Albayzin, and Antiquerula. Of these, the first, or Granada, is the handsomest, most important, most agreeable, best built, and best inhabited part of the town. It occupies the commencement of the plain, and a part of the valleys between the two mountains; it is embellished with a number of fountains, large gardens, handsome squares, and fine buildings; it is inhabited by the nobility, clergy, magistracy, and the richest of the citizens; and the principal markets are situated in it. The quarter of Alhambra, properly speaking, is only a great fortress, situated on a mountain, called Sierra del Sol, or mountain of the sun; it was the residence of the kings, whose palace still possesses great beauties. (See the description of it under ALHAMBRA.) The quarter of Albayzin resembles a fauxbourg raised on a hill, where was formerly a fort, which commanded and protected the town, from which it is separated by a rampart. It contains about 400 houses. Antiquerula has the appearance of another fauxbourg built upon the plain; it was peopled by settlers from Antequera, and is at present chiefly inhabited by dyers and silk weavers. Among the numerous squares of Granada we may specify as the handsomest, El Campo, in which is a hospital; the Plaza Mayor, which is spacious, and used for public shows, particularly the bull-fights; and the Bivarambla, embellished by a beautiful Jasper fountain, and by the two fine edifices of the Alcazaria, which was used by the Moors

Moors as a bazar, and still appropriated to the purpose of a market-place, and containing about 200 shops; and the palace of the chancery. To these two buildings we may add an ancient mosque, now a parish-church, the cathedral, two hospitals, and the two palaces of the Alhambra. The cathedral is not large, but has a handsome dome, resting on twelve arches, supported by as many large pilasters; the vault is full of paintings and richly gilt, and two rows of gilded balconies run round it over the arcades. Statues of the twelve apostles in bronze, gilt, and as large as life, are placed against the twelve columns. The vault of the church of the Chartreux is covered with fine paintings in fresco, by Antonio Palomino. In many of the houses are found remains of baths, constructed by the Moors; and most of the houses are embellished with fountains, which supply water not only for domestic purposes, but for moderating by its coolness the heat of a climate extremely warm in summer.

Granada is an archbishopric, worth 25,000*l.* a year, containing a cathedral chapter, six collegiate chapters, and 194 parish churches. This city is the seat of a royal chancery, divided into six chambers, and composed of a president, twenty-five counsellors, two solicitors, and one alguazil mayor. The intendant of the province resides here; and the town has a criminal judge, two alcaides mayors for the administration of justice, a municipality composed of a certain number of regidores, a war auditor, and a tribunal of the inquisition. The Alhambra has a jurisdiction peculiar to itself. The city is divided into twenty-three parishes, with forty convents, three beatarios, seventeen hermitas or chapels, nine hospitals, and eight colleges. Granada has an university, founded A. D. 1531; and an academy for painting, sculpture, and architecture, conducted at the king's expence, and free for all. The extent of Granada is nearly the same as it was under the Moors; but its population is very much diminished. In 1614, at the period of the total expulsion of the Moors from Spain, a very considerable number of the families of that people left it. The town, which had counted 400,000 individuals within its walls, and which had armed 100,000 warriors in its defence, is now reduced, according to the government returns stated by Mr. Townsend, (*Travels in Spain*, vol. iii.) to 52,325 souls; although, upon good authority, he says, they may be reckoned 80,000. Under the Moors, Granada carried on a great trade, and was famous for its own productions; it manufactured cloths, various kinds of woollen stuffs, and a great quantity of silks. Indeed, it is not possible to think of manufactures in Granada, without calling to mind the expulsion of the Moors, and pausing to examine the policy of that strong measure. They were numerous, and, in consequence of their industry, accompanied with frugality, they had acquired opulence and power. It is said, (see *Townsend*, *ubi supra*.) that of 100,000, condemned by the inquisition for apostatizing from the Christian faith, 4000 had been burnt without any good effect. Philip III., in the year 1609, banished to Africa 140,000 out of the kingdom of Valencia; and in the three years following, 600,000 from Seville, Murcia, and Granada. If to these we add the multitudes that perished by famine, and by the sword, we shall be inclined to state the loss to Spain at one million of its most active subjects. This loss, added to what the country had sustained by the previous expulsion of 800,000 Jews, with all their wealth, in the reign of Ferdinand and Isabella, was, under such a government as that of Spain, irreparable. The Moors are acknowledged by the best Spanish writers to have excelled in agriculture, particularly in watering their lands, in the cultivation of mulberry trees, the sugar-cane,

rice and cotton, all introduced by them; in the breeding of horses; and in the manufactures of silk, of paper, and of gun-powder, first brought into Europe by them. The manufactures of Granada, however, continued to be somewhat flourishing about the middle of the sixteenth century. Some regulations, favourable to them, were adopted and established in 1552. At that time great attention was paid to the production of silk in Andalusia, and the trade in it was prosperous. But, in process of time, the consequence of the expulsion of the Moors, the privileges and immunities granted to the hidalgos or knights, bearing in the kingdom of Granada the proportion of 1979 to 652,000, the whole number of inhabitants, and various oppressive restrictions and burthens, agriculture languished, silk was neglected, the manufactures decayed, and in the seventeenth century few or none remained. Some attempts have been lately made to revive them; some new ones have been established, in which ribbons and silk stuffs are made; but they have not been very prosperous. There is a manufacture of gun-powder on the king's account. In the production of nitre, at the salt-works near this town, about 100 men are employed in summer, and 26 in winter; and from these government obtains 3000 quintals annually. In the vicinity of Granada are some considerable plantations of the sugar-cane.

The environs of Granada are delightful; the public walks, of which the most frequented are those on the banks of the Xenil with cooling shade and refreshing fountains, and another, more wild and romantic, by the side of the Darro, are pleasant; and the country all round the city appears to be well cultivated. The market gardens appear like a wilderness of fruit trees, and yet are covered with the most luxuriant crops of all kinds of vegetables. Every cottage has a little court, or bowser, formed by a lattice frame, and wholly shaded by the vine; under which, in the evening, the peasant assembles his family to take refreshment; whilst the nightingale from every tree is uttering his plaintive note. These gardens are all plentifully watered. Granada abounds in marbles, remarkable for their variety, and fineness of grain and beauty; and it has also a variety of alabasters, jaspers, and other precious stones. Its mineral waters are also various and abundant.

GRANADA, a small town in the province of Nicaragua, seated at the S. E. extremity of the lake of Nicaragua. It has considerable commerce in indigo, cochineal, hides, and sugar. In the year 1680, this town, and also Leon, the capital of the province, were pillaged by the buccaneers of America. N. lat. 11° 15'. W. long. 86° 15'.

GRANADA, *Nova*, a vicerealty of the dominions of Spain, in South America, extending from the river Tumbez to the Caribbean sea; that is, from S. lat. 3° 30' to N. lat. 12°, or about 930 geographical miles; its medial breadth may be stated at 4° or 240 geographical miles. This grand and opulent vicerealty, though it dates its origin from the year 1718, was, after a long suppression, only established finally in 1740. It is sometimes called from its capital Santa Fe, and comprises the following provinces: viz. Jaen de Bracamoros, Loja, Cuença, Macas, Riobamba, Guayaquil, Quito, Tacames, Pailos, Barbacons, Popayan, Rapaso, Novita, Antioquia, Santa Fé, San Juan de los Llanos, Merida, Santa Marta, Cartagena, Zim, Chocho, and the Tierra Firme, including the three districts of Darien, Panama or Tierra Firme proper, and Veragua. The ample provinces which form this vicerealty were mostly discovered and annexed to the dominions of Spain about the year 1536, by Sebastian de Benalcazar, and Gonzalo Ximenes de Quesada, two of the bravest officers employed

in the conquest of America. The former, who commanded at Quito, made an attack from the south, and the latter from Santa Marta on the north. As the original inhabitants of this region were farther advanced in improvement than any people of America, but the Mexicans and Peruvians, they defended themselves with great resolution and good conduct. The abilities and perseverance of these two officers ultimately prevailed, after encountering many dangers, and reduced the country into the form of a Spanish province. The kingdom of New Granada was at first governed by the royal audience founded in 1547, and by its president the captain-general. In 1718 this arrangement was changed, and the viceroyalty was established; but it was suppressed in 1724, and finally established in 1740. When the conquerors first took possession of this country, it was more populous than the generality of the other states; and its want of population at this time prevents its being rendered one of the richest in America. The government resembles that of the other viceroyalties; with a royal audience at Santa Fé, the capital, a tribunal of account, a treasury, and a royal mint. The royal audience sits in the same hall for civil and criminal causes; there being five judges, a fiscal, a protector of the Indians, and other officers. The governments, comprehended in the royal audience, are Cartagena, Panama, Santa Marta, Maracaibo, and Porto Bello, with the district of the river Chacha; in the interior are Antioquia, Choco, Veragua, Mariquita, Giron, Neiva, and the Llanos. There is also a royal audience at Quito, and a governor and president, who rules the southern provinces in subordination to the viceroy of New Granada. But Quito remains a bishopric while Santa Fé is an archbishopric, founded in 1562, with Popayan and Cartagena as suffragans. In 1783 the archbishop was named viceroy. There are also several missions in the country called Los Llanos, and on the Apari, Meta, and Cafanari, with some little villages or stations. Those on the Upper and Lower Orinoco, and river Negro, assigned to the Capuchins in 1769, belong to the government of Caraccas.

The population of this viceroyalty has not been accurately ascertained; but if the general population of Caraccas amounts to 728,000, it is probable, says Mr. Pinkerton, that rather more than one million may be allowed for that of Granada. Of the amount of its revenues we have no certain documents; but from the amount of the annual coinage at Santa Fé and Popayan, and allowing a tenth to the king for the expences of government, they cannot be less than 220,000 pounds. The state of the military force is inconsiderable; nor would it be easy in these distant provinces to collect an effective force of five or six thousand men. The capital of this viceroyalty is BOGOTÁ, or *Santa Fé de Bogota*, for an account of which see those articles. Of the other principal cities and towns notice is taken in the progress of this work. The commerce of this viceroyalty has very much suffered by the suppression of the galleons; and though it has been encouraged by the freedom granted in 1778, it is not yet recovered. The contraband trade, carried on by the English on the Musquito shore, and from the Portuguese settlements in Brazil, and the Caribbean sea, has impeded the exertions of the Spanish colonists. Its commerce is allowed to be very disproportioned to the distinguishing advantages of this territory. Its existence almost depends on the gold from the mines, a few manufactures, and some native products. The manufactures are carried on chiefly at Tunja, Socorro, Velez, and other towns and villages towards the plains; and they consist of cotton cloths, carpets, counterpanes, and woollens of various descriptions, that support internal trade. The northern provinces pro-

duce excellent wood for the construction of ships; and the dyeing woods are superior to those of Campechy. The mahogany of Panama is exquisitely beautiful, and superior to all others. The chocolate from the banks of the Magdalena is esteemed equal to that of Caraccas; and vast harvests of cotton and tobacco might be gathered, while the navigable rivers Magdalena and Atrato, and the ports of Cartagena and Santa Marta, offer easy and commodious outlets to the European markets. Its intermediate mart of Havana presents another convenience to the traffic of this viceroyalty. The culture of coffee and chocolate is in a prosperous state in the province of Guayaquil. The salutary and useful vegetable productions of these extensive provinces are so numerous and diversified, that industry alone is wanting to open all the sources of commerce.

The climate of this extensive viceroyalty presents great variety; for though it lies under the equator, and in its vicinity, the enormous and sublime chain of the Andes, running N. and S. from the Table land of Quito and Cuenca to the Caribbean sea, and environs of Santa Marta, occasion every diversity from the snow and ice of the poles to the rain and heat of the tropics. The great rivers Magdalena and Cauca rise and terminate in this province. The animals are in general such as are common to the whole continent of S. America; and the inhabitants breed a number of horses and mules which they send to Peru. The mineralogy of New Granada cannot be reckoned unimportant; Alcedo, cited by Pinkerton, observes, that gold is here more abundant than in any other part of America. The richest provinces in this respect are those of Choco and Antioquia; and they are easily accessible by the rivers Atrato and Guacaba, which enter the gulf of Darien, and are navigable for a considerable extent. Silver is also remarkably pure; and the mines of Marquetones, in the district of Pamplona are so rich, that if they had a sufficient number of labourers, they might rival those of Potosi, as they sometimes yield eight marks of silver in the hundred weight. Copper and lead also abound, but they are not much valued; and the various kinds of precious stones are plentiful. Platina has been thought to be the peculiar product of Choco. Salt is obtained in great abundance. The natives use maize, or the Cassava root, instead of bread. Game is abundant; and the rivers and lakes furnish an ample supply of fish. The natives are tall; and wear thick, white, or variegated cloaks, which they tie round the waist with a sash. They adorn their heads with strings of painted flowers very ingeniously made of cotton. Robertson's America, vol. iii. Pinkerton's Geog. vol. iii.

GRANADIER, GRENADIER, or *Granader*, a foot-soldier, who is armed with a firelock, bayonet, and in some services a hanger, and a cartridge-box that will hold 36 rounds. They wear a high cap, fronted with a piece of brass, on which the king's arms is generally represented, &c. and a piece of cloth upon their shoulders, called a wing. In some armies they have better pay than a common soldier. They were first established in France in 1667, and soon after formed into companies: they were first known in England in 1685.

GRANADIERS, or *Grenadiers, Herse*, called by the French *granadiers volans*, or flying granadiers, are such as are mounted on horseback, but fight on foot and on horseback. These were first established in France by Lewis XIV. in 1676, and formed into squadrons.

Every battalion of foot has generally a company of granadiers belonging to it; which generally take the right of the battalion; and, being the tallest and stoutest men, frequently are the first in attacks.

We have had in England two troops of horse granadier guards; the first raised in the year 1693, and the second in 1701.

GRANADILLA, in *Botany*, the diminutive of the Spanish name of the Pomegranate. *Granada*, used in the West Indies, and retained by Tournefort and Adanson, for the *Pafflora* of Linnæus. This appellation is particularly applied to the fruit of *Pafflora quadreyderis*, much esteemed by West Indians, and sometimes ripened in England.

GRANADO, GRANADA, or *Granada*, in the *Military Art*, a hollow ball or shell, of iron, brass, or even glass, or potter's earth, filled with gun-powder, and fitted with a fuzee to give it fire.

The name granado takes its rise hence, that it is filled with grains of powder, as a pomegranate is with kernels.

Of these there are two kinds; the one large, the other small: the first are to be thrown at the enemy by a mortar, properly called *bombs*, or *shells*. The latter to be cast with the hand, and thence denominated *hand-granados*.

The best way, Casimir observes, to secure a man's self from the effect of a granado, is, to lie flat down on the ground, before it burst.

The common, or hand granado, is a little, hollow ball of iron, tin, wood, pasteboard, or other matter, filled with strong powder, lighted with a fuzee, and thus thrown by hand into places where men stand thick; and particularly into trenches and lodgments. These are now sunk into disuse.

Their composition is the same with that of *bombs*; which fee. For size, they are usually between two and three inches in diameter, about the bigness of a common iron bullet, and weigh about three pounds; as to dimensions, they are commonly in thickness one-eighth, one-ninth, or one-tenth of their diameter; their aperture, or orifice, about  $\frac{1}{8}$  wide, as prescribed by Casimir.

Thuanus observes, that the first time granados were used, was at the siege of Wachtendonck, a town near Gueldres; and that the inventor was an inhabitant of Venlo; who, in making an experiment of the effect thereof, occasioned two-thirds of that city to be burnt; the fire being kindled by the fall of a granado.

Bombs were known long before the invention of granados. The ancients had a sort of ollæ, or fire-pots, somewhat of the same nature with our granados, but they were much less perfect.

Casimir mentions a sort of blind granados, without any aperture, or fuzee, as not needing to be lighted; but being thrown with a mortar, they take fire of themselves whenever they fall on any hard solid object.

GRANARD, in *Geography*, a neat, new built market and poll town of Ireland, in the county of Longford. Adjoining is a remarkable hill or mount called the *Mount of Granard*, thought to be artificial, and the site of a Danish fort, which commands from its summit a most extensive prospect into six or seven adjoining counties. It is 52 miles from Dublin, and 12 from Longford.

GRANARY, in *Agriculture*, a building contrived for laying up and storing corn, in order to preserve it for a length of time. They have, near Grand Cairo, magazines or granaries, called "Joseph's granaries," defended with wooden walls, in which vast quantities of grain are annually preserved; and many parts of Africa abound with granaries of this kind. They are frequently deep pits made in the solid rock; the descent into them being just large enough for a man to go down; but they grow larger as soon as the person is in, and are usually square, from thirty to forty

feet in diameter. In these the great men of the country preserve their corn; they first cover over the floor with straw, then they lay on the corn, shell, as the English do, placing a thin bed of straw between the corn and the floor, as they did at the bottom. In this manner they proceed till the whole cavity is filled; when that is done they close the mouth or entrance with a sort of hurdles of great lengths of reeds, interwoven one with another. This they cover with about two feet thickness of mud, and over this raise a ridge of earth, well beaten together, in order to throw off the rain both ways, that none may geth on the place and soak into the magazine. The corn thus stored up keeps three, four, or more years very good; and, not infrequently, the proprietor being taken off by the severity of the eastern governments, under which they live, the magazine is forgotten, and some accident discovering it many years afterwards, the corn is almost always found perfectly good in it. All the care they take, in regard to the grain, is to expose it two or three days to the sun's heat, to dry it thoroughly, before they carry it into the magazine.

It may be stated further, that in the duchy of Lithuania, and in the Ukraine, the people also preserve their corn in the same manner, in wells or pits made in dry places; but in these countries great care is to be taken in the opening of these store-rooms; for, if people descend into them before they have had sufficient communication with the fresh air, they are often killed by the damp; this, however, is easily guarded against. By these, and numerous other instances of the practice of other countries, it appears evident that subterranean granaries may occasionally be highly useful for the purpose of preserving grain in particular situations and circumstances.

But the common granaries may, with proper care, be rendered much more useful than they are at present. The great caution necessary to this purpose is, to guard against the too great humidity, which is often the case in places where there is a great number of doors and windows. A too free access of the external air is also to be guarded against; as this has not only a tendency to produce the above effect, but is liable to bring in with it the ova or eggs of a number of different insects, which prey upon and destroy the corn. A third caution is, when the corn is the produce of the country where it is preserved, not to fill the place with the crop of one place only, but to mix the harvests of two or three different provinces as may be, the one dry, the other moist, or otherwise differing as much as may be; thus the contrary qualities of the one may prevent the destruction of the other. These are the principal rules to prevent the corrupting of corn: but when the mischief is once begun, it will be very difficult to stop it; all the care that can be employed should, of course, be taken in regard to these as speedily as possible.

It may be observed, that the chief points to be attended to in the erecting of granaries, are to make them sufficiently strong, and to give them such a situation as may expose them to the most drying winds. But in constructing a granary merely for the accommodation of a farm, it is unnecessary, Mr. Batefon observes, in the second volume of Communications to the Board of Agriculture, to attend to all those circumstances respecting strength, situation, &c. which ought to be observed in building an extensive granary, where large quantities of grain are sometimes deposited. A farmer seldom wishes to have a great deal of his thashed corn on his hands at once; nevertheless there ought, on every farm, to be a place of security, capable of containing, at least, one-third or one-half the grain produced

duced annually on the farm. Where the practice of housing corn is followed, there is little or no room, he remarks, within the barn for a granary; but where this is not the practice, particularly where there is a thrashing mill, the granary may be easily made over the barn; which, with proper tackle for hoisting the sacks from below, is, he thinks, the most convenient and least expensive place a farmer can have it in.

The ordering of the corn in many parts of England, after being separated from the chaff, dust, and other impurities, and well screened, is this: after bringing it into the granaries, it is spread about half a foot thick, and turned from time to time, about twice in a week; once a week they also repeat the screening. This sort of management is continued two months, and after that it is laid a foot thick for two months more, and during this time turned once a week, or twice, if the season be damp, and now and then again screened over. After about five or six months, it is raised to five or six feet thickness in the heaps, and then turned once or twice in a month, and screened now and then. When it has lain two years, or more, it is only turned once in two months, and screened once a quarter; but how long soever it is kept, the oftener the turning and screening are repeated, the better the grain will be found to keep. It is proper to leave an area of a yard wide on every side the heap of corn, and other empty spaces, into which it may be turned and tossed as often as there may be occasion. In Kent they make two square holes at each end of the floor, and one round in the middle, by means of which they throw the corn out of the upper into the lower rooms, and so up again, to turn and air it the better. Their screens are made with two partitions, to separate the dust from the corn, which falls into a bag; and when sufficiently full, this being removed, the pure and good corn remains behind.

By these means corn has been kept in granaries thirty years; and it is asserted, that the longer it is kept the more flour it yields, in proportion to the corn, and the purer and whiter the bread is, the superfluous humidity only having been evaporated in the keeping. At Zurich, in Switzerland, it is said that corn has been kept eighty years, or longer, by the same methods of management.

It is stated that the public granaries at Dantzick are seven, eight, or nine stories high, having a funnel in the midst of every floor, to let down the corn from one to another. They are built so securely, that, though every way surrounded with water, the corn contracts no damp, and the vessels have the convenience of coming up to the walls for their lading. The Russians preserve their corn in subterranean granaries, of the figure of a sugar-loaf, wide below and narrow at top: the sides are well plastered, and the top covered with stones. They are very careful to have the corn well dried before it is laid into these store-houses, and often dry it by means of ovens, their summer dry weather being too short to effect it sufficiently for the purpose.

Different contrivances have been proposed by M. Du Hamel and Dr. Hales, for ventilating or blowing fresh air through corn laid up in granaries or silos, in order to preserve it sweet and dry, and to prevent its being devoured by weevils or other insects. This may be done by nailing wooden bars or laths on the floors of the granary, about an inch distant from each other, when they are covered with hair-cloth only; or at the distance of two or three inches, when coarse wire-work, or basket-work of osier, is laid under the hair-cloth, or when an iron plate full of holes is laid upon them. These laths may be laid across other laths,

nailed at the distance of fifteen inches, and two or more deep, that there may be a free passage for the air under them. The under laths must come about six inches short of the wall of the granary at one end of them, on which end a board is to be set edgeways, and sloping against the wall: by this disposition a large air-pipe is formed, which, having an open communication with all the interstices between and under the bars, will admit the passage of air below forcibly through a hole at the extremity of it, into all the corn of the granary, that will consequently carry off the moist exhalations of the corn. The ventilators for supplying fresh air may be fixed against the wall, on the inside or outside of the granary, or under the floor, or in the ceiling; but wherever they are fixed, the handle of the lever that works them must be out of the granary, otherwise the person who works them will be in danger of suffocation when the corn is fumed with brimstone, as is sometimes done for destroying weevils. Small moveable ventilators will answer the purpose for ventilating corn in large bins or in small granaries, and may be easily moved from one bin to another. If the granary or corn-ship be very long, the main air-pipe may pass lengthwise along the middle of it, and convey air, on both sides, under the corn. In large granaries, large double ventilators, laid on each other, may be fixed at the middle and near the top of the granary, that they may be worked by a wind-mill fixed on the roof of the building, or by a water-mill. The air is to be conveyed from the ventilators through a large trunk or trunks, reaching down through the several floors to the bottom of the granary, with branching trunks on each floor, by means of which the air may be made to pass into a large trunk along the adjoining cross walls: from these trunks several lesser trunks, about four inches wide, are to branch off, at the distance of three or four feet from each other, which are to reach through the whole length of the granary, and their farther ends to be closed: seams of one-tenth or one-twelfth of an inch are however to be left open at the four joinings of the boards, where they are nailed together, that the air may pass through them into the corn. In some of these lesser trunks there may be sliding shutters, in order to stop the passage of the air through these trunks which are not covered with corn; or to ventilate one part of the granary more briskly than others, as there may be occasion. There must also be wooden shutters, hung on hinges, at their upper part, so as to shut close of themselves; these must be fixed to the openings in the walls of the granary on their outside: by these means they will readily open to give a free passage for the ventilating air, which ascends through the corn, to pass off, but will instantly shut when the ventilation ceases, and thereby prevent any dampness of the external air from entering: to prevent this more fully, the ventilation should be made only in the middle of dry days, unless the corn, when first put in, is cold and damp.

But in smaller granaries, where the ventilators must be worked by hand, if these granaries stand on staddles, so as to have their lower floor at some distance from the ground, the ventilators may be fixed under the lower floor, between the staddles, so as to be worked by men standing on the ground without or within the granary. A very commodious and cheap ventilator may be had for small granaries, by making the door of the granary serve the purpose, which may be easily done by making a circular screen, of the size of a quarter of a circle, behind it; but in order to this, the door must open not inwards but outwards, of the granary, so that, as it falls back, it may be worked to and fro in the screen; which must be exactly adapted to it in all parts of the circular side of the screen, as well as at the top and

bottom.



bottom. But there must be a step at about eight or ten inches distance from the wall, to prevent the doors falling back farther, that there may be room for a valve in the screen to supply it with air: which air will be driven in by the door, through a hole made in the wall near the floor, into the main air-trunk, in which there must be another valve over the hole in the wall, to prevent the return of the air from within.

But with the view of facilitating the labour of frequently stirring and ventilating the grain, and of lessening the expence of such buildings, a member of the Society for the Encouragement of Arts, Manufactures, and Commerce, in a letter to Dr Templeman, recommends a new-invented granary, of which the following description is given. It consists, he says, of seven stories of floors, and may be built of any dimensions, provided proper proportions are adhered to. The form of it is square, suppose fourteen feet square within the rooms or cells. The distance from the floor of one cell, to the floor of that above, is five feet; and the whole building should stand on strong posts, more or less in number, according to the dimensions, at the distance of six feet from the ground. The small stairs, or rather ladder, to go to the several cells, must be fixed on the outside of the building sideways, with a leading rail, or rope, to prevent falling. The whole granary to be built of what is generally called brick noggin; that is, it is first framed in strong timber work, and the interstices filled up with brick. The floors, beams, and joists, are to be made strong to bear the weight of the corn; and the inside of the cells well lined with dry oak-board, close jointed, and the outside weather-boarded, the boards being strongly nailed to the timber-work of the frame, and afterwards payed over with pitch. The floors of the cells are to be so contrived, as to slide towards the middle, in which part is to be an aperture six inches square, to be opened or closed by means of a sliding shutter, which must have a long handle, reaching in a groove, without the granary. On three sides of the rooms there should be windows strongly latticed, covered with wire, to keep out large insects and birds, and with strong shutters, to defend the corn from the weather. On the fourth side is a door to each room, to open from without. The windows are to be small, and as close as possible to the ceiling. Over the upper room or cell is a loft, on the outside of the door of which is fixed a crane, to be worked within by a winch and fliers. The use of the windows in the sides of the rooms, is to give the corn all the benefit it can receive from the wind and fresh air. The door, when the cell is empty, admits the workman to sweep, dat, and clean it. The method of managing corn in this sort of granary is as follows: when the wheat is properly cleaned, it is hoisted in sacks to the loft above, and emptied through a hole for that purpose in the floor. The apertures in the floors of the cells being all open (except the two undermost, which are closed by the sliding shutters), the grain falls through till it reaches the undermost cell but one: when this is filled to the height of about two feet, which may be seen through the windows, the aperture in the floor of the next cell above is shut by its slider. This being filled in the same manner, the next above it is also shut, and so on till the whole are filled, if required, except the undermost, which is left empty. In this condition the corn is left for a week or more, if it was got in very dry. When it is to be stirred, the floor of the undermost cell is to be swept very clean, the door is again shut, and the slider in the floor above drawn back, which allows the corn to fall through into that cell. When the cell above is empty, the slider is again shut, the floor swept very clean, and the slider in the next floor over that is opened. In this

manner they are all managed, till at last the uppermost cell remains empty; and the window having all been open while the corn was falling from one cell to another, a good great benefit thereto, by admitting a current of air to pass through. Under the aperture in the floor of the lower cell, a proper screen is fixed; at the end of this screen is fixed a conductor or spout, to which a sack is hung, its bottom resting on a miller's hand-barrow; the slider is then drawn, and the corn let fall on the screen, from which it runs into the sack: when the sack is full, the slider is for a moment shut, till another sack, on another barrow, is put under the conductor; the workman then wheels the first sack to the outside of the granary, and fastening the crane rope to it, it is drawn up by another workman in the loft. The same method is pursued till the lower cell is emptied. If it is necessary to screen all the corn at this time, a small screen is fixed under the aperture of the next cell to be emptied, so contrived, as to have a box at the back of it for receiving all the dust, seeds of weeds, &c. that pass between the wires: and this screen is successively fixed under every aperture as the cells are successively emptied. After the first month, the corn need be stirred in this manner only once a fortnight, and after the first six months, only once a month, unless the weather should prove in autumn very hot and damp. The advantages of this granary, as described by the inventor, are, that it is built at a small expence; that it contains a great deal of grain in a small compass; and that the grain is easily stirred and ventilated, without the tedious mode of turning it with shovels, or other similar means.

However, the plan of a granary, taken from one built on his own estate, by a very respectable and intelligent gentleman in Cheshire, who has found it to answer extremely well, it is conceived, by an able writer, will perhaps be preferable to the above, not only from its cheapness, but from its simplicity, and the easy mode by which the whole body of grain is stirred, and the air conveyed and circulated through every part of it, at whatever thickness or depth it is laid, and one floor only is necessary, however high the building may be. There can be no doubt, but that a granary of this nature may be very useful and convenient in many cases.

This sort of granary is shewn in *Plate Granary on Agriculture*, in which *fig. 1.* displays the front elevation of the building: *a* is the door into the lower part; *b*, the door into the loft above, to ascend to which a ladder is necessary; *c*, a crane for hoisting sacks up from below; *d, d, d* are air-holes for ventilation. At *fig. 2.* is seen a section or view of the inside of the building; *a, a, a, a, a*, are wooden spouts, which reach from the air-holes on one side of the granary to those on the other. These spouts are formed of inch deal, about six inches broad, and made with an angle similar to those spouts that are employed to convey off the rain water from the eaves of houses. They are placed across the granary with the angle upwards, as represented at *fig. 3*; *b, b, b*, are the ends of similar spouts, which cross the others, and also reach betwixt the air-holes on the other two sides of the building, as seen at *fig. 4*; *c, c, c*, are half spouts, extending in the same manner to air-holes on each side. It is necessary that the air-holes should decline outwards, in order to prevent the entrance of rain or snow in stormy weather; and they should likewise be secured from insects and vermin by wire cloth, *d, d*, the floor of the granary, which is three yards square, and divided each way into three hoppers, *e, e, e*, of one square yard each, making in the whole nine hoppers, as seen at *fig. 5*; *f* is a large hopper, that encompasses all the rest, and has a slider at *g* for opening occasionally, as may be necessary in taking out the grain. And there is another smaller hopper *h*, which is suspended to this by four iron ladders.

hafs: *k, k k*, that may be readily unfastened when required, from the square deal box *o o*, fixed to the large hopper. Through the hole of this box, the handle *b* of the slider must extend. This hopper is principally used for the convenience of taking out a small quantity of grain, but is removed when a large quantity is to be taken from the granary; *m* is a small loft into which the sacks of grain are heisted, and emptied over the sides or rails *n, n*, from which it falls down, and passes through the hopper *e, e*, till *f* is filled (the slider *g* being closed); and as the corn continues to be emptied from the loft, the granary is gradually filled until it is up to the top if necessary. The spouts being all inverted, as noticed above, and open below, it is obvious that, although the granary be filled to the top, the corn will not, like a fluid, rise within the spouts above the level of their lower edges; and thus there will be a vacuum left within every spout, through which the air will freely pass. These spouts are placed three feet distant from each other, horizontally from angle to angle, and eighteen inches vertically; that is, from those in one tire, to those in another, which is the next, and crosses it. The holes in the bottoms of the hoppers *a, a, a*, should be so proportioned, that one may not give vent to the grain faster than another; for which reason, the aperture of the middle one *a*, *fig. 5*, should be the smallest, because there is the least obstruction there. The apertures *b, b, b*, ought to be somewhat larger, as the grain will meet with some little obstruction there; by the sides of the large hopper; and the apertures or openings *c, c, c*, should be the largest, as the obstruction in the angles will be greater than in any other part of the work.

GRANASUOLA, in *Geography*, a town of Italy, in the department of the Amona; 6 miles N. of Faenza.

GRANATAN, a town of Saxony, in the circle of Erzgebürg; 12 miles N. E. of Freyberg.

GRANATARIUS, in *Middle Age Writers*, an officer in monasteries who took care of the provisions.

GRANATE, popularly called garnet, in *Natural History*. See GARNET.

GRANATE *Paste*. The counterfeit garnet in paste, is formed with three different proportions of the ingredients, which are these:

Take prepared crystal two ounces, common red-lead six ounces, manganese sixteen grains, zaffer three grains; mix all well together; and put them into a crucible: cover it with a lute, and set it in a potter's kiln for twenty-four hours.

Or, take crystal two ounces, minium five ounces and a half, manganese fifteen grains, zaffer four grains; mix them well together, and leave room for their swelling in the pot; bake them twenty-four hours in a potter's kiln.

The last method is this: take crystal prepared two ounces, minium five ounces; mix them, and add manganese fifty-two grains, zaffer six grains; mix them well together, and let all be baked, in a pot well luted, in a potter's kiln for twenty-four hours.

The first of these makes a very handsome garnet of the common tinge; the second, a deep one, with something of a violet tinge, as many of the natural garnets have; but the third makes much the finest and brightest. *Novi's Art of Glass*, p. 134. See GLASS and PASTE.

GRANATINE, a name given by Kirwan to several simple compounds, professedly of the granitic kind; but as it includes also combinations that have no more than one essential ingredient of granite (such as the combination of quartz, jade, or garnet), it is obvious, that many rocks, thus united into one class, are far from having all the characters of granitic compounds.

GRANATITE. See STAUROLITE.

GRANATRISTUM, in *Surgery*, denotes a boil, or a carbuncle.

GRANATUM, in *Botany*, and the *Historia Medica*. See PUMICA.

GRANBY, in *Geography*, a township of America, in Essex county, Vermont, containing 69 inhabitants.—Also, a township in Hampshire county, Massachusetts, E. of S. Hadley, about 9½ miles W. of Boston; incorporated in 1768, and containing 768 inhabitants.—Also, a township in Hartford county, Connecticut, on the line which separates Connecticut from Massachusetts; 18 miles N. of Hartford, and containing 2735 inhabitants.—Also, a small town on the Congaree, in South Carolina; a place of considerable commerce, having a curious bridge, the arches of which are supported by wooden pillars, fixed by iron-work, in the solid rock, 40 feet high above the level of the water, with the centre arch 40 feet in the clear, for admitting the passage of large trees brought down by the flood.

GRANBY *Bay*, a bay on the N. coast of the island of Dominica. N. lat. 15° 42'. W. long 61° 25'.

GRANCEY-EN-MONTAGNE, a town of France, in the department of the Coté-d'Or, and chief place of a canton, in the district of Dijon; 21 miles S. E. of Châtillon-sur-Seine. The place contains 687, and the canton 4071 inhabitants, on a territory of 210 kilometres, in 11 communes.

GRAND, a term rather French than English, though used on many occasions in our language. It has the same import with *great*, being formed of the Latin *grandis*.

In this sense we say, the grand master of an order, the grand master of Malta, of the free-masons, &c.

So also, the grand signor, the grand visier, &c. grand-father, grand-mother, &c.

In the French polity and customs there are divers officers thus denominated, which we frequently retain in English; as grand almoner, grand ecuyer, grand chambellan, grand voyer, &c.

GRAND, ANTHONY LE, in *Biography*, who flourished in the 17th century, was a native of Douay, and is denominated by some writers the "abbreviator of Descartes." He was author of many works on the subject of philosophy, the chief of these are, "Institutio Philosophiæ secundum Principia Ren. Descartes," 4to. "Curiosus Nature Arcanorum Persecutor." Notes on the Physics of Robault, which have gone through many editions; and "Historia Sacra a Mundo condito ad Constantinum magnum," which is said to be his best performance. *Moreri*.

GRAND, JOACHIM LE, a French political and historical writer, was born in 1653 at Thorigny, in Normandy. In early life he entered into the congregation of the Oratory, which he quitted in 1676, and went to Paris, where he engaged in the education of two young men of rank, and at the same time applied himself with all diligence to the study of history under the direction of father Le Coite. He first appeared as a writer in the year 1688, in "A History of the Divorce of Henry VIII. and Catharine of Arragon," in three vols. 12mo. The main object of this work is to refute certain facts and arguments contained in the two first books of Burnet's History of the Reformation. This produced a controversy between Le Grand and the English prelate, which has long since ceased to be interesting. In 1691 he addressed three letters to the bishop, on his critique of Bossuet's History of the Variations of Protestants. After this Le Grand was taken from his literary pursuits by the appointment of secretary to the abbé d'Épées, in his embassy to Portugal. In this situation he continued till

the year 1697. The leisure which his diplomatic functions allowed was employed in translations of Voyages and Travels from the Portuguese. In 1702 he accompanied the same minister in Spain, where he remained about two years as secretary. Soon after this the marquis de Forci, minister of state, took him into his service, and employed him in drawing up several memorials concerning the Spanish monarchy, and other political topics, in which he was of great use to his patron, and acquitted himself with great ability. As an author his last printed work was a treatise "On the Succession to the Crown of France." This was given to the world in 1718, and is reckoned a curious and useful performance. He died at the age of 80 in the year 1733. He had been possessed of church preferment, and had held, for a time, the office of censor royal of books. Moreri.

**GRAND**, in *Geography*, is a denomination applied to a variety of places, as in the following instances.

**GRAND Anse**, or *Jemie*, a well-built town in the western part of the island of Hispaniola; the road of which is so bad, that vessels, in order to escape the wind, are compelled to take shelter behind Cape Donna Maria. N. lat. 18° 15'. W. long. 74° 5'.

**GRAND Bay**, a bay on the S.W. coast of Newfoundland, somewhat S. of Cape Ray.

**GRAND Bourg-Salvagnac**, a town of France, in the department of the Creuse, and chief place of a canton, in the district of Guéret. The place contains 2525, and the canton 7238 inhabitants, on a territory of 215 kilometres, in eight communes.

**GRAND Canal**, in Ireland, is an establishment of which we have given some account in our article CANAL, and have here to correct an error which crept into that account, in stating that the canal terminates in the Shannon at Tarmonbarry, instead of Shannon-harbour, two miles above Banagher. The branch to the Barrow joins that river at Athy; with a collateral branch from Low-town near Monasterevin to Portarlington.

When the new part of the canal was finished in 1804, from Tullamore to the Shannon, a general repair and deepening of the old parts took place, in which 3000 men were employed for expedition, and the whole line was scoured out, so that 60 ton boats might pass. At Tullamore there are wharfs and warehouses for goods, and also at Shannon-harbour, with inns and other accommodation for persons on business.

The Doonare and Boulavoneen collieries in Queen's county, belonging to this company, were in February 1809 worked by 100 men, and they advertised for 200 more, in order to work 100 acres of a coal three feet four inches thick, which had then recently been bid dry: the canals and river navigations admitting of their being conveyed to Dublin, Limerick, Waterford, Athlone, &c.

Kildare aqueduct, eight mil. from Dublin, is 100 feet high, according to M. De Luc, *Geology*, p. 320.

**GRAND-Champ**, a town of France, in the department of Morbihan, and chief place of a canton, in the district of Vannes; seven miles N.N.W. of Vannes. The place contains 4139, and the canton 7830 inhabitants, on a territory of 202 kilometres, in four communes.

**GRAND-Couronne**, a town of France, in the department of the Lower Seine, and chief place of a canton, in the district of Rouen. The place contains 8000, and the canton 12,795 inhabitants, on a territory of 182½ kilometres, in 13 communes.

**GRAND-Fatboys**, several large detached mountains of America, in the S.E. corner of Tennessee, in which are the head-waters of French Broad, and Cataba rivers.

**GRAND Foro**, a town of Africa, on the Slave Coast.

**GRANDE Island**, an island in the Atlantic, on the coast of Brazil; 16 miles long and two broad. S. lat. 23° 15'.

**GRAND Island**, an island of America, in Lake Superior, on the N. side of the Lake.—Also, an island in Niagara river, about six miles long and three broad; in S. and is four miles N. of Fort Erie.—Also, an island at the mouth of Lake Ontario, within the British territories; 20 miles long and at its greatest breadth four miles.

**GRAND Isle**, a new county of America, in the N.W. corner of the state of Vermont, incorporated in 1822, and including the towns of North Middle and South Hero, Vineyard (late Isle Motte), and Alburgh.

**GRAND Isles**, two large islands in Lake Champlain, each about eight or ten miles long, and forming a township belonging to Vermont.

**GRAND Junction Canal**. To the full account which we gave of this very important inland navigation in our article CANAL, we have here merely to add a few particulars which have occurred since that account was printed. The act of the 50th Geo. III. for the Grand Union canal provides, that a canal with locks is to be substituted for the railway-branch from Gayton to Northampton, in order to open a communication by water, from the head of the new navigation, the design for the continuation of the Leicestershire and Northamptonshire Union canal's further south than Market Harborough, where it now terminates, being dropt, in consequence of the adoption of the Grand Union above-mentioned, which will connect the above canal with the Grand Junction. The three aqueduct arches over the Ouse at Wolverton having been made flat elliptical, instead of the curves of equilibration, and the foundation also insufficient, they gave signs of great insecurity immediately on their centres being struck, and in February 1808 two of them actually fell in and emptied the canal, as far as the Regates: fortunately, the old line of locks across the valley had not been disturbed, and the trade has suffered no interruption in consequence. A cast-iron aqueduct on brick and stone piers is now substituting for these three arches, under the direction of Mr. Benjamin Bevan, who is now the engineer to the company. In 1807 a new reservoir was completed near the side-ponds on the northern side of the Tring summit, for supplying water to the locks below the side-ponds in dry seasons.

In examining the strata and springs on the north side of the chalk summit, between Tring and Wendover, with a view to better supplying the Wendover branch and summit-level with water, Mr. Bevan discovered, that different water-tight beds in the lower chalk held up springs of a considerable height above the canal, owing to their dip to the southward; and in order to avail himself of this water, a fough or tunnel was began in the upper bank of the canal near Wendover, and has been driven about half a mile southward, intersecting different strata of chalk from beneath, and increasing in its supply of water as it proceeded: but observing that the principal part of this water was in the winter and early spring months, when the other sources were more than sufficient for the supply of the canal, it occurred to that ingenious gentleman to place a strong and water-tight valve in the most favourable part of this tunnel, which, as soon in the autumn as the canal is amply supplied from its other feeders, is shut, and kept to, until they begin again to slacken in their supply; the water in the intermediate places of these beds of chalk, in the mean time accumulating, as in a vast subterranean reservoir, the springs rise to the level which they originally did before this tunnel was begun, about 20 feet above the canal; and for many weeks

after the opening of the valve, in the beginning of summer, they pour forth a most surprising stream of water into the canal, which otherwise would have vented miles off in the chalk vallies, or slowly have made its way down through the joints and fissures in the strata to springs at the bottom of the chalk, which vent below the level of the canal.

In 1808 a twelve-horse single Bolton's steam-engine was erected near Nash-mill, in Hertfordshire, to lift the water again, the rise of four locks, for better supplying the mills during seven or eight months of the year. The company, in 1806, caused boats to be fitted up for conveying fat sheep alive, in tiers one above another, from distant places in the county, to the London markets, instead of fatiguing them by driving along the roads, the scheme of thus bringing oxen having been previously tried, and found not to answer; but after a fair trial, the expences were found to over-balance the advantages expected from this also; we are sorry also to add, that the cattle-market at Paddington has failed, and that the pens erected for it by the company have been fold and removed.

The limited quantity of coals brought to Paddington, or within 20 miles of London by this canal, now pay a duty of 10s. 9 $\frac{1}{4}$ d per ton (of 20  $\times$  112lb.), which is equivalent to the duty on Newcastle coals in the Thames: in consequence of this heavy and oppressive duty, many waggons and carts are employed in fetching coals by land, from the next wharf beyond the limited distance, near Watford. The Grand Union canal above-mentioned is begun, and is to join this canal near the S.W. end of the Braunston tunnel. The design of a branch from near Tring, through Aylesbury and Thame, to the Thames and Isis navigation and Wilts and Berks canal near Abingdon, has been again revived, and it seems probable, that an act for that purpose will pass in the ensuing session of parliament (1811).

Towards supplying water to the inhabitants near Paddington, a transfer of the company's rights has been made to a separate water-company, which is expected to be confirmed by parliament in the ensuing sessions.

In November 1806, the company declared the first half yearly dividend of 1 $\frac{1}{2}$  per cent. on the original shares, which has regularly increased to 3 per cent. half-yearly, exclusive of property tax. The affairs of the company seem now fast retrieving from the effects of their great mismanagement for many years after its establishment, and to be now in a very prosperous state; the shares (of 100*l.*) were, in September 1810, reported to be currently sold at 30*l.* each! although, at one period, the same could with difficulty be disposed of at 65*l.* to 70*l.* each: such are the effects of good or bad management, and of abilities and integrity in those entrusted with the direction and management of an immense concern like this, in inspiring confidence in commercial men to enter into trade and speculations connected with the canal, and in capitalists to invest their money in the company's shares. A resolution of the general assembly of proprietors, on the 7th of June 1803, for appointing a general superintendant of their concerns, principally led to this beneficial change. On the 11th of June following, Charles Harvey, esq. was appointed to this office by the committee, and, after much opposition from certain powerful individuals, was, on the 11th of July, confirmed therein, by a general assembly called for the special purpose.

**GRAND Key**, a small island among the Bahamas. N. lat. 26° 54'. W. long. 77° 48'.

**GRAND Lake**, a lake of Louisiana. N. lat. 32°. W. long. 93° 5'.—Also, a lake in the province of New Brunswick, near the river St. John's, said to be 30 miles

long, eight or ten broad, and in some places 40 fathoms deep.

**GRAND Luce, Le**, a town of France, in the department of the Sarthe, and chief place of a canton, in the district of Saint-Calais; 14 miles S.E. of Le Mans. The place contains 2045, and the canton 10,493 inhabitants, on a territory of 227 $\frac{1}{2}$  kilometres, in 8 communes.

**GRAND Maen Island**, an island of the Atlantic ocean; 6 miles S. by S.E. of Campo Bello island, opposite to Papamaquoddy bay on the eastern border of the United States.

**GRAND Ridge**, is a term often used, (see our article CANAL,) for the water-head, or summit line, across an island or continent, from whence the rain waters fall by opposite courses to the ocean. It results from the admirable system of vallies, which the great Creator has spread over the whole face of the earth, leaving no part, perhaps, originally of the surface, without a descent and out-fall to the sea; that the ridges, or summit-lines, form a system not less beautiful and perfect than the vallies; and whence it happens, that, from any hill whatever, it is practicable to mark on a good map, and to travel to every other hill in the same island or continent, however large, without crossing any running water, however small, but constantly to pass along a ridge or waterhead; whence the waters on the surface fall opposite ways from your route. It seems surprising, that no one has attempted to illustrate this subject by a good map, shewing all the connections and windings of these ridges in England, or even any local district, until of late, that Mr. Farey has prepared a square of map, including Derbyshire, shewing the ridges, and the situation of all the hills and principal eminences upon them, which is intended to accompany his report to the Board of Agriculture on that interesting district.

The triangular form of the British island, and the situation of the two principal rivers, the Thames and the Severn, (or rather the Bristol channel,) occasion the grand ridge of England to divide into two branches on the Chalk Downs, a few miles N.E. of Devizes; one of which, (the south-western,) proceeds to Rundaway-hill, and crosses the deep cutting of the Kennet and Avon canal, near to Devizes, near East Lavington, Warminster, Wincanton, Beamister, Crewkerne, Chard, &c. by a most circuitous route, passing almost to the north and to the south coasts alternately, until it reaches the Land's End in Cornwall: having, in this long route, probably descended to no lower strata than the red ground or marle, of which we shall speak further presently.

The other, or south-eastern branch of the grand ridge, proceeds along the chalk and the clays and sands above it, across the deep-cutting of the Kennet and Avon canal, near Burbage, by High-clere, (near which it probably occupies the highest stratum in the whole British series,) near to Alton and Hallowell, when it soon descends off the chalk into the great southern denudation, (see Philosophical Magazine, vol. xxxv. p. 130.), and pursues the under measures, through the wealds of Suffex and Kent, by Alford, Leith-hill, Handcross, (on the London and Brighton roads, being there on the lowest stratum but one which appears in that road,) by Turner-hill, Nutley, Crowborough, Rotherfield, Wadhurst, Tenterden, Shadoxhurst, Lyme (near Hythe), where it again ascends the edge of the chalk, and proceeds on it by Paddlesworth, Swingfield, and Lydden, to the coast at King's Down, near Walmer castle.

From the point of branching, N.E. of Devizes, as above described, the grand ridge follows the chalk northward by White-horse hill, near Cherhill, &c. till within a few miles

of Swindon, when it turns to the N.W., and descends to the marl, and other strata below the chalk, crossing the Woburn sand stratum, not far from Wooton-Basset; and, passing to the Bath free-stone range, it crosses the Salperton tunnel, on the Thames and Severn canal, and proceeds near to the western edges of the same strata, by Charlton-Kings, near Cheltenham, Stanway-hill, Broad-way-hill, Lemington-hill, Long-Compton-hill, and Epwell; soon after which, the grand ridge begins to leave the free-stone, and take to the dark blue clays, &c. under it, except crossing some points of the stone, and traverses the Fenny-Compton tunnel, on the Oxford canal; thence by Helidon, and near Daventry, it crosses the Brunton tunnel, on the Grand Junction canal, at Well-Haddon, and at Husband's-Bosworth, the tunnels of the Grand Union canal; when, turning north-west, the ridge passes Gilmorton; and not far from Lutterworth it crosses the Lias clays and lime-stone strata, and descends to the red marl (above mentioned), and quickly, by a great fault, or sudden lift of the strata, is brought upon the coal-measures of the Bedworth-field, and crosses the deep cutting of the Coventry canal, through Bedworth town, across the late Sir Roger Newdigate's canal, and sweeps round to the west, south-west, and south, to Kenilworth; when, having crossed another fault, and got again upon the red marl, it crosses the deep-cutting of the Warwick and Birmingham canal, near Baddesley-Clinton, and of the Stratford canal, near Hoekley; thence by Ashley-heath, and crosses the West-heath tunnel of the Worcester and Birmingham canal, and the Lopal tunnel of the Dudley canal; after which, the grand ridge crosses the basaltic hills between Rowley and Dudley, (which belong to the red marl strata,) and, descending to the coal-measures, crosses the Dudley tunnel N.W. of that town, and proceeds by Sedgley; then crossing an erect and denudated patch of the yellow lime-strata, it crosses the deep-cuttings of the Old Birmingham canal, the Wyrley and Ellington canal, and of the Staffordshire and Worcestershire canal, all near Wolverhampton town; then by Tatarhall, Wrottesley, Blimhill, Cowley, Wooton, (near Eccleshall), Broughton, Athley, Maer, Madeley-park, to Keefe, (near Newcastle-under-line,) where it has again got upon coal-measures, by Bignole-hill, and across the Harecastle tunnel, on the Trent and Mersey canal, by Golden-hill, Wickinstone rocks, and, crossing an immense fault, descends to the lime-stone shale, (see Mr. Farey's section in *Plate II.* vol. xxxi. of the *Philosophical Magazine*;) on Biddulph Moor; thence passes the top of the Great Rudyard reservoir, to Gun-hill, and crossing to High Roches rocks, it there ascends the first grit; then crosses a small trough of the first coal-shale and second grit, and descends again to the first grit, or Ramshaw rocks, and still further, on the lime-stone shale, at the Royal Cottage, along which it proceeds to the N.W. side of Flash, and then ascends the first grit again, on South-Axe-edge-hill; it again descends to the shale lime-stone in crossing Middle and Great Axe-edge-hills; from whence it ascends across the first grit and first coal-shale, and ascends the second grit on Thatch Marsh; this it pursues to the north of the Macclesfield and Buxton road, and then turning N.E. again descends to the lime-stone shale, and follows it across the Manchester and Buxton road; soon after, it ascends the first grit and first coal-shale, on Comb's-moss, and again descends to the shale, passes Sitting-low, (10 mile S.E. of Chapel-en-le-Frith,) when, turning eastward, it crosses the Great lime-stone fault, (N. of Dove-holes,) and is found upon the third lime-stone, on which it crosses the quarries and rail-way of the Peak-Forest canal; soon after, it passes over the basalt-edge of the third coal-stone,

and descends to the great fourth lime-stone in Peak-Forest, which is probably the *low-st* stratum, to which the grand ridge passes in its route through England; this lime-rock having been estimated to be four miles at least of perpendicular thickness below the top of the chalk, from whence we commenced our description; much the greater part of this vast series of strata having in this route along the grand ridge been lost suddenly by perpendicular lifts of the strata or faults, which, in proceeding to this point by more favourable routes, might have been seen bounding in succession. For about one and a half mile the ridge proceeds upon the fourth lime, then again ascends a point of the third coal-stone and third lime, to the village called Sparrow-pit, in the Manchester and Callleton road, where it again crosses the great fault and ascends to the lime-stone-shale on Ruslip-edge, whence it proceeds northward, and after crossing the Fiddle-road from Hayfield to Edale-chapel, it ascends the first grit on Edale rock, and proceeds across the moor on Kir-far-foot hills; there it leaves at the N.W. corner, and crosses the moor on the shale, and the ancient Bridle-road called Doctor-Gate, from Glossop to Ash-p-Dale; it then ascends the first grit again on soft-stones, and follows the same to Wain-stones and Blacklow-stone, which seems to be the highest land in Derbyshire, it then passes N. E. by Round-hill, and ascends to the first coal-shale, crosses the Manchester and Penitence-road at Dale-cross; where, turning N.W. it ascends the second grit, and proceeds by Dean and Breckland Edges, to cross the Glossop and Huddersfield road, on the legs upon the rock on Helme moss; from hence the ridge, after some distance, again descends to the first coal-shale, the first grit, and to the lime-stone-shale, crossing the Stange tunnel on the Huddersfield canal near Moriston; the ridge then proceeds across Black-bone-edge, and crosses the deep-cutting of the Rochdale canal, near the village of Huddersfield, (which has improperly been said in the population accounts of 1821, to be a town containing 100,000 persons;) the ridge then passes Holme on the Burnley and Farnley road, whence it proceeds, and near Colne comes again upon coal-measures, which are, however, lost again at the great fault, in which part of the Youlridge tunnel on the Leeds and Liverpool canal was driven, and which occasioned the extraordinary trouble and expence attending that tunnel, which is mentioned in our article CANAL. From hence the grand ridge proceeds, by Barnoldswick, West Marton, near the Cold-Comillora, E. of Settleton lime-stone, over Penigant-hill, Snays-fell, Nine-standards, Kelton-fall, Lime-forest, Scordal-head, Milbourn-forest, Aldstone-moor, (Incy,) Hartside-cross, Gekfdale-forest, Talkin, and crosses the Roman or Picts wall on the E. side of Upper Denton, and soon after it enters Roxburghshire in Scotland; through which it is much easier to trace this grand ridge than in England, it forming often the boundaries between the Scotch counties, to which this ridge and its collateral ridges are much better adapted than the rivers and brooks, which have generally been chosen as boundaries, but as being more permanent, and not liable to the changes which streams of water are undergoing in the bottoms of valleys, and avoiding those disputes respecting, and the delay of making and improving bridges, ferries, and the same, &c. owing to the rivers being part in one county and part in another, and by which also many of the most considerable towns are split into two or more counties, to the no small inconvenience of their inhabitants, in judicial and other county matters.

GRAND RIVER. See ORINAWA and OUSA.—A river of Africa which runs into the Indian sea, S. lat. 2° S.

—Alfo, a river of Sicily, which runs into the Mediterranean on the N. fide of the ifland, N. lat.  $38^{\circ} 3'$ . E. long.  $14^{\circ} 54'$ .

—Alfo, a river of America, which runs into the Miffouri. N. lat.  $38^{\circ} 56'$ . W. long.  $93^{\circ} 25'$ .—Alfo, a broad river of America, which difcharges itfelf into lake Michigan, N. lat.  $43^{\circ} 25'$ . W. long.  $85^{\circ} 35'$ .—Alfo, a river of America, which runs into lake Erie, N. lat.  $41^{\circ} 55'$ . W. long.  $81^{\circ} 8'$ .—Alfo, a river of Canada, which runs into the Detroit, N. lat.  $42^{\circ} 34'$ . W. long.  $82^{\circ} 42'$ .—Alfo, a river of Canada, which runs into the St. Lawrence, N. lat.  $47^{\circ} 3'$ .

**GRAND River**, or *Rio grande*, a river of Africa, which runs into the Atlantic, near the Biffagos ifles, N. lat.  $11^{\circ}$ . W. long.  $14^{\circ} 30'$ .

**GRANDE SAUV**, an Indian nation, inhabiting a territory of the Miffouri, and able to furnifh 800 warriors.

**GRAND SARRY-CANAL**. This canal is yet in the fame ftate, nearly, as when our account of it in the article CANAL was written, in 1805, except, that about two miles in length of it, at its N. E. end, has been brought into ufe, fince the Croydon canal has been completed; and that the dock for fhips, at its entrance from the Thames, was completed and opened in June 1807, and has answered fo well to the proprietors, that in the laft feffions of parliament, they made an unfeceffful attempt to obtain power for a further extenfion of them. In February, 1809, this company determined on erecting a ten-horfe ftream engine on the banks of the canal, by the Deptford road, for fupplying the neighbouring inhabitants with water, intending to let the furplus power of this engine to fome manufacturers.

**GRAND TRAVERSE**, a range of iflands, confifting of huge rocks in lake Michigan.

**GRAND TRUNK CANAL**, is a name commonly applied to the Trent and Merfey canal, which fee in our article CANAL.

**GRAND UNION CANAL**. In the feffions of parliament, 1810, (50 GEO. III.) an act paffed for making the Grand Union canal, the general direction of which is about S. W.  $23\frac{1}{2}$  miles, in the counties of Leicefter and Northampton, being confiderably elevated, and croffing the grand ridge of the ifland twice, by tunnels, its middle part for about half its length flirting near to the ridge on its welfern fide, and the two ends being on the eaftern fide of the ridge. Its objects are the completing of the long-defired water-communication between the Trent river and the many canals which connect therewith, in Derbyfhire, Nottinghamfhire, and Leicefterfhire, and the Grand Junction canal, and through it to the metropolis, without making the enormous circuit by Burton, Fradley-heath, near Litchfield, Tamworth, Atherftone, Nuneaton, and Braunftone, which at prefent goods, coming by water from Leicefter, Nottingham, and Derby muft do; it is intended alfo to fuperfede the neceffity for the fouthern part of the Leicefterfhire and Northamptonfhire Union canal, between Market-Harborough and Northampton, which on account of its difficulties has never been attempted; the prefent rail-way branch between the Grand Junction and Northampton is intended to be changed for a canal with locks, by which means the people of Northampton will have a water-communication with Market-Harborough, Leicefter, &c. with only about 14 miles longer diftance than the Leicefterfhire and Northampton Union would have been, if the fame had been completed according to its original act. Market-Harborough and Daventry are the only confiderable towns near the line of this canal, which commences in the Leicefterfhire and Northamptonfhire Union canal near Gumley, and termi-

nates in the Grand Junction canal near Buckby-wharf, near the S. E. end of the Braunftone tunnel. From Gumley in  $\frac{1}{2}$  mile is a rife of 76 feet by 12 locks, and thence to Watford, 20 miles are level, then in  $\frac{1}{2}$  mile is a fall of 53 feet by eight locks, and thence to the Grand Junction canal about three miles are level; near Husband's Bosworth is a tunnel of about 1120 yards long, and near Crick another of about 900 yards long. Near Crick it is propofed to make a refervoir of 60 acres above the canal, but below its level, fo that the furplus water collected from other parts of the canal in rainy feafons can be here referved, to be pumped up when wanted.

The width of the canal at top is 42 feet and 14 at bottom, and its depth of water five feet; the locks are 82 feet long and feven wide, calculated for 25 ton boats. This line was firft furveyed by Mr. James Barnes in 1803, and by Mr. Benjamin Bevan in 1808 and 1809, and the latter is appointed engineer for the execution of the work.

**GRAND WESTERN CANAL**, is fo denominated in an act which paffed in the year 1796, as mentioned in our article CANAL, but under which no progrefs had then been made. In April 1810, it was reported, that a beginning had at length been made on the fummit level, in Holcomb, Devon. A much larger canal, capable of conveying fhips from the Britifh channel to the fourth coaft, has been fome time in agitation, for avoiding the very circuitous and tedious navigation round the Land's End; which, however defirable, is fearcely practicable, we incline to think, for want of water.

**GRAND AFFISE, in Law**. See ASSISE.

**GRAND CAPE**. See CAPE and ATTACHMENT.

**GRAND COUTUMIER, le**, an ancient book of very great authority, which contains the ducal cuftoms of Normandy.

**GRAND DAYS**. See DAY, in Law.

**GRAND DISTRESS, diffictio magna**; a writ of diftrefs, fo called on account of its extent, which reaches to all the goods and chattels of the party within the county.

This writ lies in two cafes: either when the tenant or defendant is attached and appears not, but makes default: or where the tenant or defendant hath once appeared, and after makes default. On fuch occasions, this writ lies by common law, in lieu of a petit cape.

**GRAND ELIXIR, guard, jury, larceny, prior, procefs of France, ferjeanty**. See ELIXIR, GUARD, &c.

**GRAND GUSTO, in Painting**. See GUSTO.

**GRANDE, in Geography**, a town of Norway, in the diocefe of Drontheim; 21 miles N. W. of Drontheim.

**GRANDEE** is underftood of a lord of the firft rank or prime quality.

In Spain, the term grandees is ufed abfolutely to denote the prime lords of the court, to whom the king has once given leave to be covered in his prefence: there are fome grandees for life only; made by the king's faying fimply, be covered. Others are grandees by defcent; made by the king's faying, be covered for thyfelf and heirs. Thefe laft are reputed far above the former.

There are fome who have three or four grandeeffhips in their family.

**GRAND-GOR**. A Scotch appellation for the venereal difeafe.

In the Philofophical Tranfactions, N<sup>o</sup> 469. feft. 5. we have a proclamation of king James the IVth of Scotland, ordering all who had this difeafe, or who had attended others under it, forthwith to repair to an ifland in the Frith of Forth. If the grand-gor was the pox, and this diftemper came into Europe at the flege of Naples in 1494; it muft have made a



very quick progress to cause such an alarm at Edinburgh in 1497.

GRANDI ERCOLE, in *Biography*, whom Vafari calls Ercole da Ferrara, was a painter of the early ages in the art after its revival. He was a disciple of Lorenzo Costa, whom he afterwards surpassed in excellence, and at whose death he was appointed to complete the work of the Crucifixion, begun by the former for Domenico Garganelli, in the church of St. Pietro in Bologna, by which he gained great reputation for the excellence of the colour, and the truth and force of expression; although it is wrought in the dry style of Mantegna and P. Perugino. When unfortunately the chapel was destroyed, that part of the picture which was preserved was placed in the palace Tanara. His peculiar shyness of manner made him many enemies in Bologna. He therefore quitted it and went to Ferrara, where he produced many works which are very scarce now. His fondness for wine shortened his life, and he died at the age of 40 in the year 1531.

GRANDI, FRANCIS LEWIS, who flourished in the latter end of the 17th, and the commencement of the 18th centuries, was born in 1671 at Cremona. He was disposed to a studious life, and chose the profession of theology, in order that he might freely indulge his inclination. He entered into the religious order of Camaldolites, at Ravenna, at the age of 16; and on this occasion he relinquished his own Christian name, and received that of *Gay*. He became, in the early progress of his studies, distinguished for his proficiency in the different branches of literature and science, and being dissatisfied with the Peripatetic philosophy of the schools, he was ambitious of contributing to introduce a more rational system. With this view he offered himself as a candidate for the vacant professorship of philosophy in the school of Florence, and obtained his object, though not without the most determined opposition from the prejudiced adherents to the old opinions. He now applied himself to the introduction of the Cartesian philosophy, while, at the same time, he became zealously attached to mathematical studies. The works of the great Torricelli, of our countryman Wallis, and of other celebrated mathematicians, were his favourite companions, and the objects of his familiar intercourse. He published a treatise to resolve the problems of Viviani on the construction of arcs, which he dedicated to the grand duke Cosmo III., who was so delighted with the performance, that he appointed the author professor of philosophy in the university of Pisa. From this time Grandi pursued the higher branches of mathematics with the utmost ardour, and had the honour of ranking the ablest mathematicians among his friends and correspondents. Of the number may be named the illustrious Newton, Leibnitz, and Bernouilli. By his life of St. Peter Damiano, published in 1702, and his examination of the legends of St. Romauld, he gave offence to the bigots of his community, and was deposed from the dignity of abbot of St. Michael at Pisa; but the grand-duke had too liberal a mind to be offended; and to shew the estimation in which he held the philosopher, he immediately appointed him his professor of mathematics in the university, which, perhaps, led to his re-instatement in the abbacy. He now resolved some curious and difficult problems for the improvement of acoustics, which had been presented to the Royal Society in Dublin, and having accomplished his object, he transmitted the solutions, by means of the British minister at the court of Florence, to the Royal Society at London. The principal work of Le Grandi was "A Treatise on Series and Infinitesimals." He appeared likewise as the defender of Galileo's doctrine respecting the earth's motion, and obtained a complete victory

over those who opposed it. He was deeply versed in the principles of political economy, and various disputes were referred to his decision respecting the rights of liberty, &c. He was appointed commissioner from the grand-duke and the pope of Rome jointly, to settle some differences between the inhabitants of Ferrara and Bologna, concerning the works necessary to preserve their territories from the ravages of inundation. For these and other important public services he was liberally rewarded by his employers. Returning to his literary labours, Le Grandi engaged in a contest with Le Ceva, on the subject of the philosophy of the ancients and moderns. This discussion was excited by a preface to a Latin poem by Le Ceva, in which he maintained that none but heretics would renounce the philosophy of Aristotle. The remainder of his life was spent in various mathematical pursuits, and in the prosecution of studies of science, which are too numerous to be recited here. He died at the age of seventy-two in the year 1712. *Memoirs*.

GRANDIER, URBAN, was born in the latter part of the 15th century. His father, a notary royal at Saumur, gave him a good education, and introduced him while young among the Jesuits at Bourdeaux, to whose society he recommended himself, as well by his natural genius and fine understanding, as by his diligence and proficiency in his studies. Conceiving highly of his talents, the fathers of the college gave him the living of St. Peter, at Loudun, of which they were the patrons, and procured him a prebend in the church of the Holy Cross. These benefices rendered him the object of jealousy with ecclesiastics, which was still farther heightened by the accomplishments of his person and the elegance of his manners. With his friends he was easy, facetious, and agreeable, but extremely haughty towards those whom he regarded as his enemies. Some of his brethren of the clergy he had exasperated, by the arrogance with which he triumphed over them, upon gaining certain suits in the ecclesiastical court, and he raised a host of foes by his reported successful gallantries with the ladies, to the great mortification of disappointed rivals, incensed fathers and husbands. A league was formed with a view of driving him entirely out of Loudun: a heavy charge of debauchery, irreligion, and impiety was laid against him, in the bishops' court of Poitiers, which produced, first, a suspension of the priests' functions; and afterwards he was condemned to resign his benefices, and to the practice of penance and mortification. From a sentence so severe, Grandier appealed to the archbishop of Bourdeaux, by whose means he was acquitted, and even allowed to sue for the recovery of damages, and the restitution of the profits of the benefices during his suspension. The archbishop, a friend to peace, earnestly recommended him to change his residence, but he was incapable of renouncing his favourite passion, revenge. He returned to Loudun, bearing in his hand a branch of laurel, and in his mind a fixed resolution of humbling his enemies. They were equally bitter, and smarting under the lash of the victor, they set about means to compass his destruction. A priest, named Mignon, devised a plan, which ultimately enabled them to gratify all their malignity. He trained up nuns in the Ursuline convent at Loudun, to retort the part of women possessed with evil spirits; these were instructed to accuse, in their frantic fits, Grandier of having subjected them to demoniacal influence. At first he was indifferent to the reports, considering the business as a mere farce. It had, however, a most tragical conclusion. Grandier, at length, finding, from the effects produced upon the credulous devotees, that matters were taking a serious turn, appealed to the magistrates, conscious of his own innocence, and requesting them to take cognizance of the matter. They

began the investigation, and were satisfied that the whole was the effect of trick, but when they attempted to interpose their authority, and prohibit the continuance of such disgraceful proceedings, the priests who had patronized and instructed the women, and who were bent upon the destruction of Grandier, disowned their jurisdiction and defied their power. An application was made to the archbishop of Bourdeaux, who employed physicians to examine into the case, and by their reports no doubts were left in the mind of the prelate, that the business was founded on the most gross and scandalous imposture. Upon this the archbishop issued an order, the severity of which put the whole legion of devils to flight. After a time the scheme was renewed, and the authors of it contrived to engage cardinal Richlieu to favour their malignant designs. For this purpose the monks of Loudun wrote to father Joseph, one of their fraternity, informing him that Grandier was author of a satire, entitled "The Shoemaker's wife of Loudun," containing reflections on the cardinal's birth and person, which had excited in the bosom of the cardinal the sharpest stings of resentment. Believing that the information was correct, he determined to make the satirical feel the full weight of his vengeance. Grandier was arrested and brought to trial, and after a tedious process, in which the force of exorcising the possessed was several times repeated, and the judge's partiality and tyranny displayed in the most glaring light, "upon the deposition of Ashtaroth, a devil of the order of Seraphim, and the chief of the possessing demons, and upon the depositions of the nuns, who pretended to be possessed of devils, the commissioners gave judgment, declaring Grandier duly attainted and convicted of the crime of magic, sorcery, and possession, happening by his means in the persons of some of the Ursuline nuns, &c. for the reparation of which he was condemned to an amende honourable, and to be burnt alive with the magical characters." Grandier, innocent of the charge, heard the sentence without any emotion, and afterwards sustained the torture, ordinary and extraordinary with astonishing fortitude, never suffering one repining expression against his enemies to escape him through the whole scene. The last words which he was heard to utter previously to the flames reaching his vital parts, were in supplication to God, to whose mercy he recommended himself. Such was the fate of Urban Grandier, whose pride and passions appear to have been causes of the conspiracy to which he fell a victim, and whose history exhibits a memorable example to show to what pitch of folly and madness the fury of an incensed cabal, the revenge of a minister, and the prostitution of a judge, may be wrought up. The relations of the case is given in "The History of the Devils of Loudun," first published at Amsterdam in 1693, and which has been frequently reprinted. As another Grandier is known by a funeral oration for Scævola de St. Martha, which is highly commended for the masterly strokes of eloquence interperfed through it. Moreri.

**GRANDINES**, in *Surgery*, small tumours on the eyelids.

**GRANDMONT**, in *Geography*, a town of France, in the department of the Upper Vienne, near which was an abbey, suppressed in 1769; 15 miles N.E. of Limoges.

**GRANDOLA**, a mountain of Portugal, in the province of Estremadura, containing 800 heufes, situated between Cadix and the sea-coast. Behind it is the Sierra de Grandola, that proceeds in two ranges, one behind the other, from east to west; the town is 27 miles S.E. of Setuval.

**GRANDPRE**, a town of France, in the department of the Ardennes, and chief place of a canton, in the district

of Vouziers; 33 miles E. of Reims. The place contains 1350, and the canton 8617 inhabitants, on a territory of 24 $\frac{1}{2}$  kilometres, in 14 communes.

**GRANDRIEUX**, a town of France, in the department of the Lozere, and chief place of a canton, in the district of Merde; 10 miles N.W. of Langogne. The place contains 1657, and the canton 5389 inhabitants, on a territory of 235 kilometres, in 7 communes.

**GRAND-SERRE**, LI, a town of France, in the department of the Doubo, and chief place of a canton, in the district of Valen.e. The place contains 1491, and the canton 6189 inhabitants, on a territory of 232 $\frac{1}{2}$  kilometres, in 10 communes.

**GRANDVILLE**, or **GRANVILLE**, a town of France, in the department of the Channel, and chief place of a canton, in the district of Avranches, 12 miles N.W. of it. The place contains 5454, and the canton 12,290 inhabitants, on a territory of 80 kilometres, in 8 communes. The harbour can receive only about 60 small vessels. The town is seated on a sharp rock, forming a peninsula of an oval form, and surrounded with walls; it has two gates, and two faux-bourgs. Near it is an oyster-fishery, and on the land side quarries of large and very hard stones. N. lat. 48° 50'. W. long. 1° 32'.

**GRANDVILLIERS**, a town of France, in the department of the Oise, and chief place of a canton, in the district of Beauvais; 14 miles N.N.W. of Beauvais. The place contains 1633, and the canton 12,655 inhabitants, on a territory of 167 $\frac{1}{2}$  kilometres, in 22 communes. N. lat. 49° 39'. E. long. 2° 2'.

**GRANDWALDEN**, or **GRAN**, a town of Norway, in the diocese of Christiania; 26 miles S. of Christiania. The town stands on an eminence in the midst of an extensive plain, looking down on several conical rocks, covered with firs, and remarkable for two churches in the same church-yard, called the "Two Sitters."

**GRANGE**, an ancient term for a barn, or place wherein to lay up and thresh corn.

The word is formed of the Latin *granca*; or of *granum*, grain, corn, &c. Hence also *granger* or *grangier*, a grange-keeper or farmer.

Hence *grange* is a name which was formerly much applied to such farm-houses as were provided with large barns, granaries, and other similar offices, for the preservation of grain, &c.

**GRANGE** is also used, in a more extensive sense, for a whole farm, with all the appendages of stabling for horses, stalls for cattle, &c. and for an inn.

**GRANGE, JOSEPH DE CHANCEL DE LA**, in *Biography*, born in 1676 of an ancient French family, at Antoniat in Perigord, exhibited from his boyish days a singular passion for poetry and romance. He was educated among the Jesuits at Bourdeaux, and when he was only nine years old, he composed a comedy in three acts, which was represented by his school-fellows. His early talents seemed to have marked him out for distinction, and his mother took him to Paris, and obtained for him the place of page to the princess of Conti. Before he was sixteen, his tragedy of Jugurtha was represented in the capital, and was applauded as a most extraordinary effort of such a stripling. He continued to write pieces for the stage, which were productive of reputation and pecuniary advantages; but the work which rendered him famous, though it exposed him to much mortification and suffering, was entitled "Philipiques," a satire in verse, directed against Philip, the regent duke of Orleans. This appeared in 1718, and it charged the duke with the crime of poisoning several branches of the royal family.

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The author attempted to escape, but, falling into the hands of his pursuers, he was committed to the prison of St Marguerite. It appears that he was not brought to trial, and that he contrived to effect an escape from prison and the country, but upon the death of the regent he returned to France, where he lived unmolested. He died at his family seat of Antoinat in 1758. His works were collected in five vols. 12mo. and, with his own corrections, published the year after his decease. They consist chiefly of tragedies, operas, and miscellaneous poems. The tragedies are most esteemed: they are said to be "artful in the construction of the plot, and abounding in interesting situations, but feebly written, and trite in language and sentiment." In his latter years he employed his time on a history of Portugal. In manners he had all the fire and vanity of a Gascon: he had few friends, and seems to have been more feared on account of his satirical powers, than beloved for his virtues.

GRANGE, in *Geography*, a town of Sweden, in the province of Dalecarlia; 33 miles S. S. W. of Falun.

GRANGE, *La*, a cape on the N. coast of the island of Hispaniola. N. lat. 19° 55'. W. long. 72° 30'. This cape, with Point de Dunes, forms the mouth of the bay of Monte Christi, in the county of Stirling.

GRANGE Point, a cape on the S. coast of the Isle of Wight. N. lat. 50° 38'. W. long. 1° 15'.

GRANGE River, a river of Upper Canada, which empties itself into a bay of the same name on the N. shore of lake Superior, W. of the Cris. This river leads to Nipigan, a place which formerly furnished the best beaver and martin, and was the farthest advanced post of the French traders, at the time when Great Britain conquered Canada.

GRANGEA, in *Botany*, Adanson, v. 2. 121. Juss. 184. Class and order, *Synzenesia Polygamia-sup. rhusa*. Nat. Ord. *Compositæ discoides*, Linn. *Corymbif. re*, Juss.

Gen. Ch. *Common calyx* imbricated, spreading; its scales oblong, obtuse. *Cor.* compound; the united florets of the disk very numerous, tubular, five-cleft, regular; females fewer, in the circumference, tubular, three-cleft. *Stam* in the united florets, filaments five, capillary, very short; anthers united into a cylinder, with five teeth. *Pist.* Germen small; style thread-shaped, the length of the filaments; stigma undivided in the united florets, cloven in the female ones. *Peric.* none, except the permanent calyx. *Seed* solitary to both kinds of florets, obovate, compressed, crowned with a toothed border. *Recept* hemispherical, naked.

Ess. Ch. Receptacle hemispherical, naked. Seed-crown membranous, toothed. Calyx imbricated, spreading. Florets of the radius three-cleft.

We have alluded to this genus under ETHULIA, from which it differs in having a crown to the seed, florets of the radius three-1 f, and scales of the calyx obtuse. It most approaches *Tanacetum* in character, but is sufficiently distinct. The following are the only species we have been able certainly to determine.

1. *G. maderaspatana* (*Artemisia maderaspatana*; Linn. Sp. Pl. 1190. *Tanacetum Aegyptiacum*; Jacq Hort. Vind v. 3. 46. t. 88. *Abinthium maderaspatanum*, *Senecionis incani folio, corymbis solitariis in ramulorum fistigio speciosis*; Pluk. *Amalth* 3. t. 353. f. 3. *A. minus odoratum gangeticum*, floribus chamaemeli foliariis e foliorum alis; Pluk. *Almag.* 2. *Phyt.* t. 1. f. 2. —Leaves flouated, somewhat serrate, hairy. Flower-stalks elongated.—Native of the East Indies. *Root* annual, tapering, branched. *Stems* procumbent, a span or more in length, subdivided, leafy, downy. *Leaves* alternate, sessile, deeply pinnatifid, in a lyrate form, and sinuated, clothed with soft whitish hairs, their segments rather rounded. *Flowers* yellow,

almost globular, near half an inch in diameter, on axillary, solitary, simple, hairy stalks, half as long as the leaves. Linnæus in both editions of Sp. Pl. quotes Plukenet, t. 357. f. 3. Adanson, his professed critic, seems to have argued the error in copying Linn, and cites t. 257. f. 3; which has given us a great deal of trouble; more especially as we have a plant from the Paris garden for Adanson's *Grangea*, which proves *Hippia integrifolia*, Linn. Suppl. 389, and does not answer to the character or habit of *Grangea*. Nevertheless, as it came with such authority, we have laboured in vain to find any thing like it in Plukenet, and thought for a while we had found it in t. 45. f. 3, which bears a rude resemblance to our specimen, but is *Parthenium Heterophyllum*. Finally, Burmann's *Sphæranthus africanus*, II. Ind. t. 69. f. 2, which is not that of Linnæus, and which Jussieu suspects may be a *Grangea*, is not unlike the *Hippia*. If it be our plant, his suspicion is refuted. The leaves in our specimens are occasionally undivided or lyrate, more cut than in Burmann's plate, and less so than in Plukenet's t. 45. f. 3. The calyx, however, which is well expressed in the latter for the *Parthenium*, does not accord with our's.

2. *G. minima*. (*Artemisia minima*; Linn. Sp. Pl. 1190. Burm. Ind. 177. t. 58. f. 3.)—Leaves wedge-shaped, bluntly toothed, smooth. Flowers nearly sessile.—Native of China, and the East Indies. We received it in 1803, from the stove of the late right honourable Charles Greyville at Paddington, where it was preserved rather for its rarity and singularity than beauty. It is an annual plant, much smaller in all its parts than the foregoing, smooth, prostrate, of a light green colour. *Flowers* the size of a small pea, axillary, nearly sessile, whitish, sometimes with a purple tinge. Their structure is extremely minute.

We scruple to admit *Ethulia decaricata* into this genus, though somewhat similar in habit, because of its naked seed, and sharp calyx. See ETHULIA.

GRANGLMOUTH, in *Geography*, a village of Scotland, of considerable extent, founded by Sir Lawrence Dundas, upon the angle formed by the junction of the river Carron and the canal. It deserves mention as a place of considerable trade. Vessels bring into this port under, hemp, flax, deals, and iron, from the Baltic, Norway, and Sweden, and grain from foreign markets, as well as from the coasts of England and Scotland. The trade to London is carried on by the Carron shipping company; 3 miles E. N. E. of Falkirk.

GRANGERIA, in *Botany*, so named by Comber in memory of M Granger, a surgeon, who travelled into Egypt and Judæa between the years 1720 and 1736, from whence he sent numerous seeds to enrich the botanic garden at Paris. He published, in 1745, in 12mo. *Relation de voyage fait en Egypte en 1730*, according to Hillar, who mentions him as "not a trifling man, though he touched but slightly upon botany." He greatly depreciates the wonders and fertility of Egypt. Juss. 240. Lamarck *Ill. r.* t. 427. Class and order, *Legum. in Mongolia*. Nat. Ord. *Papilion.* Linn. *Regiæ.* Juss.

Gen. Ch. *Perianth* inferior, of one leaf, bell-shaped, with five ovate, acute, permanent segments. *Cor.* Petals five, roundish, scarcely longer than the calyx, inserted into its rim. *Stam.* Filaments fifteen, awl-shaped, longer than the petals, inserted into the calyx; anthers roundish. *Pist.* Germen superior, obovate, woolly; style one, thread-shaped; stigma obtuse. *Peric.* Drupa obtuse, somewhat triangular. *Seed.* Nat. triangular, of one cell.

Ess. Ch. Calyx five cleft, inferior. Petals five. Germen woolly. Drupa with a triangular nut.

1. *G. lusifolia*.—A tree, native of the Isle de Bourbon, where

where it is called *Arbre de buis*, or Box tree, from the similitude of its *leaves* to the *Buis*. These are about an inch long, ovate, acute, entire, veiny, smooth on both sides, nearly sessile, with a pair of small awl-shaped *stipulas*. *Flowers* small, in terminal or axillary clusters. *Fruit* somewhat like that of an olive, but smaller, and rather angular.

GRANHULT, a town of Sweden, in the province of Smaland: 35 miles N. W. of Calmar.

GRANI, in our *Ancient Writers*, mustachoes or whiskers of a beard.

The word seems formed from the ancient British or Irish, *grann*, a beard.

It is given for a reason why the cup is refused to the laity, "Quia barbati, & prolixos habent granos, dum poculum inter epulas fumunt, prius liquore pilos inficiunt, quam ori infundunt."

GRANIFEROUS, producing or bearing any sort of grain.

GRANIFEROUS *Pods*, a term signifying such pods as contain small seeds of some of the grain kinds.

GRANILITE. Under this denomination Kirwan comprehends all varieties of granite that contain more than three ingredients, such as quartz, feldspar, mica, and garnet: such supernumerary ingredients, however, must be considered as accidental, and of too little importance to confer the distinction of a particular name on the granite in which they occur.

GRANINGE, in *Geography*, a town of Sweden, in Angermannland, on a lake; 40 miles N. W. of Hernofand.

GRANITE, an aggregate rock, the essential ingredients of which are feldspar, quartz, and mica, being the same as those of gneiss, from which granite differs chiefly in the arrangement of the three component parts: their being mingled without order or regularity, produces a granular structure, while that of gneiss is generally flaty. (See GNEISS.) It is, probably, this granular nature of the rock in question which has procured it its name; though some authors are of opinion that the word *granite* is nothing but a corruption of *granites*, a name mentioned by Pliny, as that of a stone of the colour of a stork's neck. The fact is, that the word *granite*, which is now adopted by almost all European nations, originated with Italian antiquaries, and Tournefort was not the first writer who makes mention of it.

The three constituent parts of granite vary with regard to their colour, size, relative quantity, form, and freshness.

The colour of this rock is generally more or less reddish, because the feldspar, usually the predominating part, is oftener of that than of any other colour. Sometimes the feldspar is greyish and yellowish-white, and so like the admixed quartz, that it can be distinguished only by its peculiar fracture and lustre. It has been observed that the red colour occurs more frequently in the newer, while the greyish-white appears to be more characteristic of the older formation of granite. Also long continued exposition of granite to the action of the atmosphere contributes to render its feldspath pale or grey. Yellow and green feldspar seldom occur as ingredients of granite.—The colour of the quartz is usually greyish; sometimes this part is perfectly colourless and transparent, in which case, as the grains cannot be viewed by transmitted light, it appears deep grey or black.—The mica is much more frequently black or grey, than brown or perfectly white.

The absolute size of the ingredients of granite is subject to considerable variation; they are seen from very large to very fine granular, the latter being more frequent in the newer formation. With regard to the relative size of its constituent parts, we distinguish equally mixed from une-

qually mixed granite; the former being that in which the magnitude of the three ingredients is nearly the same.

The quantity of these parts is equally various: so that sometimes one, sometimes two of them predominate: upon the whole it is the feldspar that is found in the greatest proportion, and the mica in the least. There are, indeed, some varieties of granite in which the quartz or mica are entirely wanting. Such binary aggregations of the granitic kind have received distinct appellations by some authors. Those of quartz and feldspar, or feldspar and mica, were called simple granites by Wallerius; semi-granites by Blumenbach; and Kirwan proposes to denote all these duplicates in general by the name *granitell*, specifying, when necessary, the constituent peculiar parts of each. The aggregate of quartz and mica is called *gestell-stein*, or *stell-stein*, by some of the older German writers; and that of feldspar and mica, especially when the latter is of a brown or brownish-red colour, and forms the predominant ingredient, has obtained the Finlandic name of *Rapakivi*. Such distinctions, however, are unnecessary and inapplicable, since often in one and the same granitic mass the proportion and number of the component parts are seen considerably to vary. Besides, there are many rocks enumerated by authors as granitels, which cannot, with any propriety, be referred to granitic compounds; such as feldspar with hornblende, with nephritic stone, with garnet, steatite, or the same separately combined with quartz or mica.

There is but very little variety in the form of the component parts: they are almost always massive and indistinctly angular, and seldom occur in the form of regular crystals. The feldspar is found crystallized in Bohemia, at Schlackenwalde, near Carlbad; at Tzeidler, in the Saatz district; also near Hohenwalde, in Upper Palatinate; at Ochsenkopf and Kessel, on the Fichtel-gebirge; at Schneeberg, in Saxony; in England; in the island of Arran, &c. The granite in which these feldspar crystals are seen, is often of such fine grain, and the quartz and the mica are so intimately united with each other, that they form, as it were, a matrix for the crystals: such granite is called *porphyritic* granite. Part of the pavement on Westminster and Blackfriars' bridge consists of this species of granite. Something like crystallization of the quartz is now and then observed in granite, but it is always irregular. In the variety, called graphic or Portfoy granite, in which the feldspar constitutes by far the greatest part of the mass, and which contains mica in small groups, at great distances from each other, the quartz is disposed in such a manner, that when the rock is cut in a certain direction, it exhibits forms which bear some distant resemblance to written characters: whence it has obtained its name. But by some, neither the Portfoy nor Siberian graphic stones are considered as true granites.—Also, the mica is now and then found crystallized in granite, such as in Siberia, at Waldheim, Metweida, Johan-georgenstadt, in Bohemia, &c. In a variety of granite of Mount St. Gothard, all the three constituent parts are said to occur crystallized together.

The feldspar is also sometimes found in the shape of coniform concretions, representing on their fracture a surface comparable to the paws of some animals, or to the petals of flowers: this singular variety comes from the neighbourhood of Breitenbrunn, in the Upper Ertzgebirge.

With regard to the *freshness* or state of preservation which these three ingredients exhibit, we have to observe that the feldspar, which, in general, has a vitreous lustre and a perfectly foliated fracture, is also seen in various stages of decomposition; it occurs dull, earthy, friable, and even entirely disintegrated, in which state it is known by the name of porcelain-earth. This disintegration takes place chiefly near the surface

## GRANITE.

face of granitic mountains, and in the immediate vicinity of veins. Granite, with feldspar thus converted into an earthy state, is found in Cornwall, on the Hartz, at Burkardigrün in Saxony, &c.; and it is probable to Mr. Emmerling that the *gießs-stein* (Saxum fusorium, Linn.) which, on account of its loose texture, is made use of in the brass foundries of Sweden and France, may be granite in a similar state of incipient decomposition. Also, the mica is subject to disintegration, especially when acted on by subterraneous water and vapours; the mass into which it is thus converted is considered as being of the nature of floatite. In this state it is found at Fichtelberg, in the Upper Palatinate, and in the vicinity of Tornitz, near Coslbad, in Bohemia.

Besides feldspar, quartz, and mica, other fossils are found admixed, which, not being considered as essential, are generally distinguished by the appellation of *accidental ingredients*. They are, 1. Shorl; the most frequent of all. It occurs in five and disseminated, sometimes also crystallized, and appears principally to belong to the old granite-formation: it is found in several parts of Saxony, in Lower Bavaria, Upper Palatinate, Wirttemberg, Transylvania, Cornwall, &c.; 2. Garnet; mostly in small grains. It occurs but rarely; but has been found near Leipzig (in boulders), at the Greifenstein, and in the neighbourhood of Voigtsdorf, in the vicinity of Freiberg, in Saxony, in Lower Bavaria, &c. An aggregate of quartz, mica, and garnets, is by the Swedes called *norka* or *murkiten*. 3. Tinstone; frequent in the granite of Geier, Zinnwald, &c. 4. Nephrit or jade appears to occur not only in gneiss, but also with real granite, in Switzerland. 5. Rock crystal. 6. Beryl; in the island of Alba, and perhaps also in Siberia. 7. White common opal, sometimes occurs in the granite of Eibentock in Saxony. 8. Topaz is sometimes seen, together with tinstone, in the granite of Zinnwald. 9. Calcareous spar, very feldom. 10. Fluor-spar, the same; in Siberia, at Geier in Saxony. 11. Barytes, equally feldom; in Switzerland.

*Foreign beds* are less frequently met with in granite than in other rocks. The more remarkable ones are those of tin-stone, galena, and blende at Zinnwald on the Bohemian frontiers; the beds of mica, particularly in Silesia and Lusatia; of quartz, and rock crystal in Switzerland. Also beds of feldspar are said to occur in it. The green feldspar, called Amazon stone, is found in large masses in the granite of the Ural mountains of Siberia.

*Stratification of Granite* — Though granite occurs frequently as widely-extended masses, in which the eye is unable to discover any continued traces of parallel separation; yet there can be no longer any doubt that those geologists, who absolutely denied the existence of stratified granite, were either entirely unacquainted with the structure of many of the European granitic mountains, or too much influenced by the principles of their favourite theories, to allow the observed traces of demarcation to be any thing but irregular and accidental rents and fissures. Pini even endeavours, by mathematical figures, to prove the impossibility of stratification in granite. Notwithstanding all this, the observations of the most eminent geologists appear to prove that such stratification, even in the strictest sense of the word, is not uncommon; but it is often a matter of great difficulty, for an eye, unaccustomed to viewing the structure of mountains on a large scale, to distinguish the parallelism, or to follow the obscurely marked progress of the line of separation of the strata, especially when they are of considerable thickness.

But in many cases, it would appear that this stratification

is too distinct to leave any doubt upon the mind of the observer. Nothing can be more convincing than the account given by Gruber of the stratified nature of the granite composing the Riesengebirge, that separates Silesia from Bohemia. The rocks that chiefly compose this celebrated range of mountains are granite and gneiss, which, on the highest point, such as the Riesen and Schnee-Kuppe, are seen in fourfold alternation. Mr. Gruber has ascertained the dip and direction of the strata in eight places, and proved them to be perfectly distinct from the rents which are frequently seen nearly at right angles with the lines of stratification.

From Saussure's observations, made on the several granitic pyramids or "aiguilles" of the Mont-Blanc, it would appear that all the parts of this mountain are composed of vast layers of granite perpendicular to the horizon, and directed from N.E. to S.E. Still more distinct this stratification appears on Mount St. Gothard. (See GOHARD.) According to Charpentier, Lesko, and others, also the granite of the whole of Upper Lusatia, and of several parts of Saxony, affects the stratified structure.

In a similar manner Mr. Gruber observed the regular stratification near Coslbad and Teplitz; and Dr. Reufs found the same in several other parts of Bohemia; such as in the Eger district, where the strata dipped north at an angle of 18°; in the Saatz district at Lefchkau; in the Leutenitz district on the Saxon frontiers; at the Wolfberg, where the strata run from two to six feet in thickness; as also in several places in the district of Buntzlau, towards the Riesengebirge. La Perouse describes the granite of part of the Pyrenees as disposed in layers or beds.

In the north of Europe, similar regularity appears to prevail in the stratification of granite; thus, according to Cronstedt and others, in Sweden, on the Kinnekulle and Billing, in West Gothland, the granite (consisting mostly of red feldspar, white quartz, and black and greenish mica, in nearly equal proportion) is observed in distinct layers, with superincumbent strata of rocks of subsequent formation.

Pallas followed vast and continuous layers of granite through whole tracts of mountains in Siberia; indeed, part of the granitic Ural mountains, in the neighbourhood of the lake Kolywan, are described as having the appearance of huge artificial structures, in which the layers appear to be loosely piled on one another.

Dr. Hutton supposed granite, when not shistose in its structure, to be altogether unstratified; professor Playfair, however, in his exposition of the Plutonic system, so far differs from the opinion of his ingenious friend, that he allows granite to form strata also where it has no character of gneiss; and he thinks that this admission does not embarrass the theory with any new difficulty; but, on the other hand, he suspects that the stratification ascribed by the Neptunists to the granite mountains is, in many instances, either an illusion, or at least something very different from what, in other stones, is accounted stratification. Professor Playfair found stratified granite, in England, at Chedley Forest, in Leicestershire, where, particularly near Mount Sorrel, beds of granite are seen, holding the same direction with those of the subjacent "horn-stone schistus;" and likewise at Faisset-water in Berwickshire, where the beds of granite run from about S.S.W. to N.N.E. conformable to the schistus on either side of them. Respecting the granite mountains of Arran, we have it observed by the same philosopher that this stratification appears doubtful. The mountain of Gouard, in that interesting island, appeared, contrary to what Mr. James had advanced in his "Mineralogy of the Scottish Isles," without any vestige of stratification in its granitic part, as did also the whole

## GRANITE.

whole group of mountains to which it belongs; for though he saw large tabular masses, sometimes nearly vertical, separated by fissures, they appeared to him to be much too irregular, too little extended in length and height, and vally too much in thickness, to be reckoned the effects of stratification. As in the third volume of Jameson's "System of Mineralogy," Arran is not mentioned among the localities where stratified granite occurs, it would appear as if that geognostian does not lay any stress upon his first remark on the nature of the above-mentioned mountain.

The relative age of the different varieties of granite has engaged the attention of several writers on geology; but it must be said, that most of the opinions that have been broached on this subject, and the various ideas entertained by theorists respecting what they call regeneration of granite, are too vague, or at least too little founded on actual observation, to be entitled to particular notice. Some geologists on the other hand have absolutely denied the existence of a second and third granite-formation. The Wernerian school admits three distinct formations of granite. The *first* or *oldest* is that which, of all rocks we are acquainted with, is sunk the deepest into the interior of the earth, and which therefore may with propriety be considered as the fundamental rock. This oldest granite also constitutes the highest parts of the surface of the earth, and, thus elevated, is generally surrounded, and, as it were, enveloped by other primitive rocks. It is frequently coarse-grained and porphyritic. It occurs both stratified and unstratified; and it is the latter which is often seen in large globular distinct concretions of considerable dimensions, such as in several parts of Bohemia, in the Fichtelgebirge, in the island of Arran, &c.

This formation is, of course, far more widely extended than those of a more recent origin. The *second granite formation* is considered as occurring only in veins which never reach any of the newer rocks, but are confined to the oldest formation. Such granite is marked with less regularity of structure, than what is observed in the older formation; at the same time that it surpasses the newest granite, both with regard to the regularity of arrangement, and superior firmness of the constituent parts. The *third*, or *newest granite-formation*, is always found super-incumbent on older primitive rocks, often in an unconformable and over-lying position: it also occurs in veins, which have been seen to intersect or traverse veins of the second granite formation; as a certain criterion of the greater relative age of the latter. Its structure, according to the characteristic given of it by professor Jameson, is very irregular; it has a deep red colour, and contains sometimes grains of garnet, and often fragments of various primitive rocks of various magnitude. When it occurs in veins, these are, according to the same author, not connected with any rock beyond the strata which they traverse. Examples of this newest formation are, that at Greifenstein, a large group of steep rocks between Ehrenfriedersdorf and Geier in the Saxon metalliferous mountains, where the coarse granular and irregularly aggregated granite, composed principally of feldspar and quartz, with but a small portion of mica, occurs resting on mica slate, in an unconformable and over-lying position: it contains nests of quartz and feldspar, as also fragments of gneiss and mica slate, from the size of a cubic each, to that of 100 cubic feet and upwards. Another instance of this formation we have in the tin stockwork at Geyer, where it is contained in a hollow of gneiss, and agrees in its characters with that of Greifenstein. Another portion of the same formation, is that at Johannegeorgenstadt, Auerberg, and Eibenstock, where, however, it occurs only in veins, which are from a foot to several fathoms wide, and are usually traversed by metalli-

ferous and other veins. Mr. Mohs has given a very good characteristic of this newer granite. Veins of the same kind occur also in Bohemia, Upper Lusatia, at Minella in the Alps, in the Shetland islands, in Glen Morison, and in the Highlands.

The nature of the just mentioned *granitic veins* is considered in a different light by Dr. Hutton, according to whom all veins, whether they are obviously connected, or whether they have no apparent connection, with any large mass of granite, are coeval with, and constitute a part of the main body of what is called the oldest granite by the followers of the Neptunian system. Mr. Playfair has given several examples of veins invisibly connected with larger masses; in those at the isle of Coll, in the Hebrides, at Portsoy, in Cornwall, in Glen Tilt; and of such as are visibly connected with the main granitic body, in those occurring in the island of Arran, in Galloway, in Inverness-shire, St. Michael's Mount, Cornwall. Mr. Jameson, however, says that he has convinced himself, after a very careful examination of the rocks of the island of Arran and of Galloway, that they do not afford a single instance of granite veins, shooting from the oldest granite into the adjacent rocks, nor of veins traversing newer primitive rocks, as it has been insinuated to be the case with the granite veins in Glen Tilt. The same author observes on this occasion, that veins of feldspar have been frequently confounded with granite veins, and he subjoins some observations on this subject communicated by the late Dr. Mitchell, according to which there is a most palpable difference between supposed and genuine granite veins; the former being frequently narrower than one inch, and commonly much ramified, and sometimes tortuous; but they constantly adhere most firmly to the adjacent stone, and when they contain apparent fragments, the flaty structure of these is ever conformable to that of the contiguous rock; while genuine granite veins never fall short of some inches, are always pretty straight, seldom giving off branches: they have a distinct separation, and contain fragments of the adjacent rock, which lie promiscuously; the granite is constantly uniform, containing the three ingredients equally mixed; and Dr. Mitchell has always found it small-grained. The supposed granite, according to him, consists of feldspar, of a very unequal grain, inclosing sometimes spots of mica, and rarely specks of quartz. From all which this mineralogist concludes, that the last mentioned veins are nearly of contemporaneous origin with the rocks in which they are contained, and ought, therefore, to be considered as, and called, feldspar veins.

Although granite is the hardest, and one of the most durable rocks we are acquainted with, it is, nevertheless, subject to *disintegration*, which manifests itself not only in the crumbling of the surface of the exposed parts of granitic beds, but likewise in the separation of vast masses, which, being divided by the enlargement of the rents and fissures that generally traverse the granitic mountains, or cross the strata in a nearly vertical direction, are partly precipitated from their high situation, partly displaced in various manners, so as to produce the appearance of huge artificial structures, and of other objects to which the fancy of the beholder may compare them.

M. De Lue has seen on the Riesenbirge, in Silesia, a number of pillars produced by such disintegration, both solitary and grouped together, in a straight line, and, at a distance, presenting the appearance of many high piles of gourds.

The Adon-sholo mountains in Dauria, which consist of granite, are, according to Pallas, in many parts broken into all manner of shapes, representing vast ruins, grottos, and immense flat masses piled on one another in all directions.

Several



—Several of the mountains are, as it were, strewed with blocks of granite, which, at a distance, appear as numerous herds of cattle; and it is this circumstance which is said to have procured this ridge the name of Adon-sholo, a Mongole word, denoting herd-like mountains. All these detached rocks are fragments of the vast strata of granite that compose the greatest part of the Dauric mountains. The summits of the Goatfield and other mountains of Arran have the appearance of huge walls composed of large granitic masses. At Huelgouet, in Lower Brittany, we are informed by Monnet, as also in the Vosges, enormous masses of granite are seen piled on one another, and forming most extraordinary groups. The granite being here divided into masses by fissures, which are filled up with granite possessing less solidity, this latter is sooner acted upon by atmospheric agency, whence, by its disintegration, the masses become perfectly detached, and adopt various positions. But besides the accidental groups formed by the rolling down of the rocks, there are other groups of granitic rocks at Huelgouet, that appear to be in their natural position, and many of them form an assemblage of rock masses, which have a perfectly rhomboidal form, and are regularly joined to each other by means of their corresponding planes. One of the insulated rocks in a group at Huelgouet, is called *Pierre branlante*, or the rocking stone: it is 21 feet long, seven feet high, and eight feet wide, and its cubical content is 1160 feet: it is so accurately poised on the edge of another rock, which serves for its base, that the strength of a few men suffices to change its centre of gravity, and to communicate an oscillatory motion to it. The phenomenon of the *rocking stones* is not unknown in this country; the largest is that seen at the Land's End in Cornwall, where they are called Logan-stones; it weighs upwards of sixty tons, resting on another rock of granite of considerable height close on the sea-shore. "The two stones," says Mr. Playfair, who avails himself of this phenomenon among others to explain the migration of stony masses, "touch but in a small spot, their surfaces being considerably convex towards one another. The uppermost is so nearly in an equilibrium, that it can be made to vibrate by the strength of a man, though to overset it entirely would require a vast force. This arises from the centre of gravity of the stone being somewhat lower than the centre of curvature of that part of it on which it has a tendency to roll; the consequence of which is, that any motion impressed on the stone forces its centre of gravity to rise, (though not very considerably,) by which means it returns whenever the force is removed, and vibrates backward and forward, till it is reduced to rest. Were it required to remove the stone from its place, it might be most easily done, by cutting off a part or blowing it away by gun-powder; the stone would then lose its balance, would tumble from its pedestal, and might roll to a considerable distance. Now, what art is here supposed to perform, nature herself in time will probably effect. If the waste on one side of this great mass shall exceed that on the opposite in more than a certain proportion, and it is not likely that that proportion will be always maintained, the equilibrium of the Logan-stone will be subverted, never to return. Thus we perceive how motion may be produced by the combined action of the decomposition and gravitation of large masses of rock."

It was probably from seeing the fantastical and imitative forms produced by granitic cliffs, and by the disintegration of granite, that M. Vitte framed his unfortunate hypothesis respecting the pyramids of Egypt, and the ruins of Persepolis, Palmyra, and Balbec, all which, together with the temple of Jupiter at Girgentum, the palaces of the Incas in

Peru, &c. &c. were considered by that antiquary as productions of nature.

Granite is much less *metalliferous* than gneiss and other primitive mountain; but tin and iron abound in it. Besides these, several other metals occur in it in small proportion, *viz.* gold, though very rarely, in Peru; native silver, almost equally seldom, at Wittichen and Alt-Wolfach, in the Black Forest, near veins of silver and cobalt; copper; galena, for instance, at Schreiberhaußen, at the foot of the Schneekuppe, in Silesia; bismuth, zinc, cobalt, manganese, molybdena, arsenic, tungsten, and wolfram, all of which occur generally in small veins; but tin, galena, and blende, are found in beds at Zinnwald in Saxony, and in Bohemia.

As to the *extent* of granite over the world, it may be said that scarcely any country we are acquainted with is entirely destitute of that rock. In Asia we have the Uralian and Altaic mountains, with the Caucasus; in Africa, the Atlas, several mountains of Egypt, and the Cape of Good Hope; in North America, some mountains of New York, Pennsylvania, and Virginia; in South America, great part of the Andes, the mountains de los Mariches in the Carracas, the Cordilleras of Parana, Sierra Nevada de Merida, &c.; in Europe, the Seewoga mountains of Scandinavia, those of Finland, the Carpathes, the Hartz, the Riesen-gebirge, the mountains of Upper Lusatia, a part of the Saxon metalliferous mountains, (especially Eibenstock, Johangeorgensladt, Schwartzenberg, Schneeberg, Ehrenfriedersdorf, Geier, Nauendorf, Altenberg, and Zinnwald,) the Fichtel-gebirge, the Odenwald and Schwarzwald, the Alps of Switzerland and Savoy, the Apennines, Pyrenees, the mountains of Cornwall, &c. all which have granite for their principal constituent rock.

The *use* made of granite is manifold: it is employed for building, paving, steps, for troughs in stamping mills, for millstones, &c.

The use of granite for architectural and economical purposes is perhaps no where more amply displayed than at Petersburg, where not only the imperial and other palaces, but even ordinary dwelling houses, have their lower parts lined with slabs of granite. The left bank of the great Neva, from the foundery to the gulf of Cronstadt, and both banks of the Fontanka and of the Catharine canal, are lined by high walls constructed of such slabs of granite; as are many bridges over the Neva, balustrades, &c. The pillars, stairs, balconies, &c. in the palace of Cronstadt, are almost all of the finest kinds of granite. Those employed for ornamental architecture are cut and polished by lapidaries; but those intended for less delicate purposes, such as common slabs, steps, cylinders, troughs, &c. are worked by peasants, particularly by those of Olonek. The government towns, however, Moscow not excepted, are too distant from the chief granite mountains, to be enabled to make frequent use of that rock for the above purposes.

Granite has been more particularly applied, together with sienite, for the purposes of architecture and statuary, by the ancients, especially by the Egyptians; and many very interesting monuments of their skill and patience are still existing in the collections of antiquities.

M. Brand has divided the different granites used in the arts after their predominant colours; the following are the principal varieties, in which, however, the black and white kind is not included, one of its ingredients being hornblende, which assigns it a place among the sienites. See SIENITE.

*Grey Granite of Obelisk*, in the department of the Rhire; it consists of white quartz and black mica, with large crystals of rose-coloured feldspar. The columns of the Eglise

d'Enée (ancient temple of Augustus) at Lyons, are of this kind of granite, which has also been worked by the Romans.

*Grey Granite of Thain.*—It consists of grey quartz, black mica, and white feldspar crystals, which are sometimes from two to three inches long. The quarries of this granite are on the road from Lyons to Valence, on the right bank of the Rhone. It is very well adapted for the construction of large monuments. The granite of St. Peray, not far from Thain, is exactly like this, except that its feldspar crystals are of a rose-colour.

*Grey Granite of Lavizz.*—Found in the small island Lavizz, near Bonifacio, S. of Corsica, in the straits that separate this island from Sardinia. This granite is composed chiefly of small irregular crystals of feldspar, mixed with a little black mica, besides which it contains also feldspar crystals, of a milk-white colour. In the quarry of that island a large unfinished column is to be seen, which has been relinquished by the Roman workmen.

*Grey Granite of Elba.*—Its grain is pretty uniform: its colour sometimes approaches to light violet. There are four columns of this variety to be seen in the Musée Napoléon: they were taken out of the church which contained the tomb of Charlemagne, at Aix-la-Chapelle.

The grey granites are much more common than the green or greenish, of which the following deserve to be mentioned.

*Antique green Granite.*—Its predominant ingredient is white quartz, which contains here and there some light green feldspar. There is a column of it in the Villa Pamphili, near Rome.

*Fine grained antique Granite.*—(Basalte verd oriental.) The component parts of this work are so minute and intimately blended, that they can scarcely be distinguished by the naked eye. Its colour approaches to deep olive. It is very hard, and takes a fine polish. The Egyptians have much employed it for the construction of monuments; and several statues of it may be seen in the Capitol and the Villa Albani. There is another variety with white spots, which is known at Rome under the name of Basalto Orientale pidocchiofo; this is very rare, for there are but two columns of it in existence, namely, in the church of St. Pudentiana at Rome. Some varieties bearing that name are violet.

*Granite of St. Christ-ph.*—composed of violet quartz, white feldspar, and green mica. This magnificent rock is found at Oisans, in the department of the Isère.

*Corsican orbicular Granite.*—This beautiful rock (which probably belongs to the sienite formation) was discovered by M. Barral, in the island from which it derives its name. Its composition is very extraordinary; it has a basis of ordinary grey granite, which, however, in moist parts, exhibits a considerable portion of hornblende. But what more particularly characterizes it, is a number of balls, of from one to two inches in diameter, each composed of several concentric and perfectly parallel layers, the outermost of which, generally white, opaque, and two or three lines thick, is composed of quartz and feldspar, blended in various proportions, and exhibiting a radiated appearance, rather converging towards the centre of the ball. The second layer, which is of a greenish-black colour, and about one line thick, is composed of fine laminar hornblende; and this is succeeded by a white, generally translucent quartz layer, of about four or five lines in thickness, inclusive of two or three very thin layers of hornblende, that are generally seen within the substance of this third principal layer. Each of these layers is generally of equal thickness in the whole of its circumference. These three parts may be considered as the coating: the interior of each ball is less defined than the surrounding

layers; it consists of a blackish and a whitish substance, the former surrounded by, and passing into the latter, the centre of which is usually a dark-grey spot.

The quarry of this rock is unknown, a single block only having been found in the gulf of Valinco, in Corsica: its weight was about 80 pounds; but it was soon broke into small fragments, which are now distributed among collectors. There is a beautiful vase of it, one foot six inches high, in the cabinet of M. Dedrec. The granite of Corsica is figured by M. Faujas de St. Fond, in his "Eiffai de Géologie," and in Mr. Sowerby's "Exotic Mineralogy."

Among the red granites, we have what is called *red oriental granite*, which, as usually containing hornblende, often in large separate patches, will be described under **SIXTH**.

*The red Granite of Ingria.*—This granite, says M. Patrin, is distinguished from others in this, that the feldspar, instead of being in grains, or paralleloiped crystals, as in most other granites, constantly appears in the shape of round or oval pieces of from half an inch to two inches in diameter. This granite takes a very fine polish, and in this state exhibits the feldspar in the shape of white, round, or oval *chatoyant* spots, in a reddish ground. The rock, which serves as a pedestal of the equestrian statue of Peter the Great, at St. Petersburg, is of this granite: the block was originally 32 feet long, 21 feet thick, and 17 feet long; but, in order to give it its present shape, imitative of a picturesque natural rock, it has been much diminished in size. This block was disengaged from a swamp, about forty versts from Peterburgh: its weight was calculated to be above three millions of pounds. We have seen several fragments that were detached from the very block forming the pedestal of the statue; but in none of them did we observe the form ascribed by Patrin to the feldspar.

The public summer promenade-garden at Peterburgh is decorated with a superb colonnade of this granite: the columns, which are sixty in number, are of the Tuscan order; their shafts, made of one piece, are about twenty feet high, and three feet in diameter. The island, called Kotlin-Ostrow, on which is the fortress of Cronstadt, is covered with blocks of this granite, the feldspar of which is sometimes of the kind called Labrador-stone.

*Red Granite of the Vosges Mountains.*—This granite is composed of large laminae of rose-coloured feldspar, grey grains of quartz, and small scales of mica. It has so strong a resemblance to the Egyptian red granite, that it is difficult to distinguish them. Its quarries are on the heights of Montaujen, near the Papuan mountains, in the Vosges.

*Violet Granite of Elba.*—The feldspar of this variety is in large violet crystals. The pedestal of the equestrian statue, in the Piazza della Santissima Annunziata at Florence, is made of it, as are also the sodes in the chapel of St. Laurence in the same town.

*Rose-coloured Granite of Baveno.*—This beautiful granite consists of flesh-coloured feldspar, white quartz, and some grains of black mica. Considerable quarries of it are found on the borders of the Lago Maggiore, which are worked, without intermission, for supplying Milan, and the whole of the neighbouring country, with this granite. It takes a very fine polish; here and there it exhibits ribbands, or zones, of a grey colour, which are composed of the same ingredients as the rest of the mass, but reduced into very minute particles. Many columns, porticos, &c. are seen of it at Milan.

The name of *graphic granite* is given to those kinds in which the feldspar forms large concretions, intermixed with grey quartz-crystals, exhibiting, when cut transversely, angular

gular figures, mostly shaped like a 7; while others are less regular, and bear a distant resemblance to rude alphabetical writing. They are not considered to be genuine granite by some mineralogists.

*Graphic Granite of Portfoy.*—The feldspar is of various tints of pale flesh-red; the quartz dark, but transparent, with now and then some small particles of mica. This rock is minutely described by Dr. Hutton.

*Graphic Granite of Siberia.*—Its feldspar is of a yellowish-white, or reddish colour; the quartz, exhibiting figures similar to those of the quartz in the preceding sort, is of the variety called smoky topaz. Mica occurs in it in small nests, and black thori in acicular crystals.

*Graphic Granite of Autun.*—Of a pale rose-colour; quartz-crystals grey, very numerous. It is found in the neighbourhood of Autun, department of Saône-et-Loire, particularly at Marmagne. This, in M. Brand's opinion, is the most beautiful of all graphic granites. Another variety of this stone is found at the same place: its feldspar is white; the quartz grey, in small crystals; it is susceptible of very fine polish.

*Graphic Granite of Corsica.*—Likewise of a rose-colour; but generally paler than that of Autun, from which it is also distinguishable, by its quartz-crystals being larger, and at greater distance from each other. It contains some thinly disseminated bronze-coloured mica. It takes a fine polish.

**GRANIVOROUS**, an epithet or denomination given to such animals as feed upon corn, or any other grain or seeds.

Granivorous animals are chiefly of the bird kind. These have a peculiar provision for the digesting of so dry and hard a food.

**GRANNA**, in *Geography*, a town of Sweden, in the province of Smaland; 18 miles N.N.E. of Jonkioping.

**GRANO**, in *Biography*, a performer on the trumpet and German flute, and a composer of tunes for those instruments, which had their day of favour in the early part of the last century. He was a kind of mungrel dilettante, who during many years condescended to make concerts and give lessons, en professeur, always insinuating that it was merely for the pleasure of amusing the public and intrusting individuals. Grano's trumpet march was long used by the Guards.

**GRANON**, in *Geography*, a small island on the W. side of the gulf of Bothnia. N. lat. 61° 5'. E. long. 17° 5'.

**GRANSEE**, a town of the Middle Mark of Brandenburg; 30 miles N.N.W. of Berlin. N. lat. 52° 59'. E. long. 13° 13'.

**GRANSO**, an island in the Baltic, near the E. coast of Sweden. N. lat. 57° 46'. E. long. 16° 5'.

**GRANSON**, a town of Switzerland, in a bailliage of the same name, belonging to Bern and Friburg, situated between the lake of Neuchâtel and mount Jura, and remarkable for the battle in which Charles the Bold, duke of Burgundy, was defeated by the Swifs in 1476; 16 miles S.W. of Neuchâtel. N. lat. 46° 50'. E. long. 6° 26'.

**GRANT**, **CONCESSIO**, in *Law*, the regular method by the common law of transferring the property of *incorporal* hereditaments, or such things of which no livery can be had. (Co. Litt. 9.) For which reason all corporeal hereditaments, as lands and houses, are said to lie in livery; and the others, as advowsons, commons, rents, reversions, &c. to lie in *grant*. (Ibid. 172.) The reason is thus given by Bracton (l. ii. c. 18.): "*traditio, or livery, nihil aliud est quam rei corporalis de persona in personam, de manu in manum, translatio aut in possessionem inductio; sed res incorporales, que sunt ipsam jus rei vel corpori inherens, traditionem non patiuntur.*" These, therefore, pass merely by the delivery or the deed. And in signories, or reversions of lands, such grant, to-

gether with the attornment of the tenant, (while attornments were requisite,) were held to be of equal notariety with, and therefore equivalent to, a feoffment and livery of lands in immediate possession. It therefore differs but little from a feoffment, except in its subject-matter; for the operative words therein commonly used are *habere et tenere*, "have given and granted." For the difference between gifts and grants, see the article GIFT. The king's grants are matter of public record. (See RECORD.) No feoffment can be given to the king, nor derived from him, but by matter of record. To this end a variety of officers are employed, communicating in a regular subordination one with another, through which all the king's grants must pass, and be described, and enrolled; that the same may be narrowly inspected by his officers, who will inform him if any thing contained therein is improper, or unlawful to be granted. These grants, whether of lands, honours, liberties, franchises, or aught besides, are contained in charters, or letters patent. (See PATENTS.) The manner of granting by the king does no more differ from that by a subject, than the construction of his grants when made. 1. A grant made by the king, "at the suit of the grantee," shall be taken most beneficially for the king, and against the party; whereas the grant of a subject is construed most strongly against the grantor. It is therefore usual to insert in the king's grants, that they are made, not at the suit of the grantee, but "*ex specialia gratia, certa scientia, et mero motu regis;*" and then they have a more liberal construction. 2. A subject's grant shall be construed to include many things, besides what are expressed, if necessary for the operation of the grant. Thus, in a private grant of the profits of land for one year, free ingress, egress, and regress, to cut and carry away these profits, are also inclusively granted. (Co. Litt. 56.) And if a feoffment of land was made by a lord to his vassal, this operated as a manumission (Litt. 9 286); for he was otherwise unable to hold it. But the king's grant shall not extend to any other intent, than that which is precisely expressed in the grant. As, if he grants land to an alien, it operates nothing, for such grant shall not also extend to make him a denizen, that he may be capable of taking by grant. (Bro. Abr. tit. patent. 62. Finch. l. 110.) 3. When it appears, from the face of the grant, that the king is mistaken, or deceived, either in matter of fact or matter of law, as in case of false suggestion, misinformation, or misrecital of former grants; or if his own title to the thing granted be different from what he supposes; or if the grant be informal; or if he grants an estate contrary to the rules of law; in any of these cases the grant is absolutely void. (Freem. 172. Finch. 101, 102.) To prevent deceits of the king, with regard to the value of the estate granted, it is particularly provided by the statute 1 Hen. IV. c. 6. that no grant of his shall be good, unless, in the grantee's petition for it, express mention be made of the real value of the land. Blackst. Com. vol. ii.

**GRANTHAM**, in *Geography*, a township of Upper Canada, in the county of Lincoln, fronting lake Ontario.

**GRANTHAM**, a market and borough town in the toky, or wapentake, of the same name, in Kesteven division of the county of Lincoln, England, is situated on the side of the river Witham, on the ancient Roman road called Linnæe street. The town comprises four principal streets. The church is an elegant stone structure, consisting of a nave and two spacious aisles, with large handsome pointed windows, and is celebrated for its lofty spire, which is 273 feet in height. The style of architecture appears to be that of the thirteenth century; though Mr. Gough observes that the church was endowed by Hugh, bishop of Lincoln, A.D.

1100. Beneath the church is a chancel-house, filled with human skulls and other bones. Among several handsome monuments in this edifice, are, one to sir Thomas Bury, chief baron of the exchequer in the time of George I, and one to sir Dudley Ryder, chief justice of the King's Bench, in the succeeding reign. The font exhibits a fine specimen of ancient sculpture.

Grantham was incorporated under a charter granted by Edward IV. in 1463; when it first returned members to parliament; the representatives are chosen by the freemen of the borough. The civil government is vested in an alderman, a recorder, 12 common burgesses, a coroner, an escheator, and twelve second men, who are the common council. The jurisdiction of this corporation extends over the whole soke, comprehending twelve villages, and the alderman acts as sheriff of the town and soke, the sheriff of the county having no authority within the soke and district thereof. The guildhall was rebuilt under an act of parliament in 1787. A free-school was founded here by Richard Fox, bishop of Winchester, and further endowed by king Edward VI.; this school attracts attention, from the circumstance of its having been a place of education to that luminary of science, sir Isaac Newton. Near the south entrance into the town, on St. Peter's hill, formerly stood an elegant cross, erected by king Edward I., in memory of Eleanor his queen, who died in 1290; this being one of the places where the corpse was laid in state in its way for interment in Westminster Abbey. Grantham is distant from London 111 miles N., has a well supplied market on Saturdays, and five annual fairs. In the return under the late population act, the number of houses is 631, occupied by 3303 inhabitants.

A canal has been lately cut from Grantham to the river Trent, an extent of 25 miles. It is supplied with water by means of large reservoirs made for that purpose. The chief articles conveyed by this navigation are corn and coals. Turner's History of the Soke of Grantham, &c. Beauties of England and Wales, vol. ix.

GRANTHAM CANAL, is the parliamentary name of an inland navigation about 33 miles long, in the counties of Nottingham, Leicester, and Lincoln, of which we gave an account in our article CANAL, and nothing material has occurred to be added thereto.

GRANTOWN, a town of Scotland, in the county of Inverness; 17 miles S. of Fores.

GRANVILLE, GEORGE, baron Lansdown, in *Biography*, a nobleman chiefly remembered as a poet, born in 1667, was son of Barnard Greenville, one of the distinguished family of Greenville or Granville, the latter mode of spelling the name being introduced by the subject of this article, who is thereby separated from the rest of his house. He shewed very early talents, and was entered, in his 12th year, at Trinity college, Cambridge. In the same year, he wrote a copy of verses on the duchess of York's visit to the university, and on the accession of James II. he offered in consequence to the new prince in three short pieces, of which Dr. Johnson says, "the first is profane, and the two others such as a boy might be expected to produce." In 1688, when an invasion was threatened, he was desirous of devoting his life to the service of James, and requested his father to present him to the king for that purpose. The revolution succeeded, and being possessed of neither interest nor considerable fortune, he lived in literary retirement. During this period his dramatic works were chiefly composed and acted. The first of these was "The Gallants," said by himself, by way of apology, to have been written at an age when some persons are but beginning to spell. This was afterwards

brought forward in a more correct form, under the title of "Once a Lover and always a Lover." His tragedy of "Heroic Love," founded on the fable of Homer's Iliad, was acted the same year with great applause from the wits and critics. On this occasion he was complimented in a copy of verses from the pen of Dryden. When queen Anne came to the crown, Mr. Granville emerged from the political obscurity in which he had lived: his fortune was increased by the death of his father, and that of his uncle, who left him an annuity. He was now elected a member of parliament for the borough of Fowey, and feeling the common ardour of his countrymen of all parties against the ambition of Lewis XIV., he joined other literary persons in a translation of the Philippics of Demosthenes, to rouse the nation to oppose the Philip of modern times. By the death of his elder brother sir Bevil Granville, in 1706, he succeeded to a good estate, and he continued to serve in parliament, sitting as knight of the shire for the county of Cornwall. On the change of administration in 1710, he was appointed secretary of war in the room of sir Robert Walpole. He married in the same year Mary, the daughter of the earl of Jersey, then widow of Thomas Thynne, esq. Shortly after this he was introduced into the house of peers by the style and title of lord Lansdown, baron of Biddeford, at the memorable creation of twelve peers, in one day, viz. December 31, 1711. The elevation, however, of lord Lansdown was not one of those which appeared very extraordinary, as two peerages had become extinct in the Granville family. On account of his principles and conduct he stood high in favour of the queen, who made him a privy counsellor, comptroller and treasurer of the household; but the accession of George I. put an end to the power of his party, and deprived him of his place. He remained steady to his former connections, protesting against measures which he deemed unconstitutional, and in consequence of his zeal he was regarded with a suspicious eye, and was reckoned by people in power as a disaffected man. Upon the breaking out of the rebellion in 1715, he was committed to the Tower, and kept confined in that fortress till February 1717, when he obtained his liberty and resumed his seat in the house of lords. In 1719 he opposed with violence the proposed repeal of the bill to prevent occasional conformity; his speech on the subject he afterwards printed. Subsequently to this a derangement in his private affairs, owing to the want of economy, obliged him to spend some years on the continent. During his absence, the first volume of bishop Burnet's "History of his own Times," making its appearance, lord Lansdown undertook the vindication of the duke of Albemarle and the earl of Bath, from some aspersions thrown upon them in that work. He also took occasion to vindicate his great uncle, sir Richard Greenville, from the unfavourable representations of his conduct by lord Clarendon, and archdeacon Echard. On this occasion he published two tracts in 1732. In the same year he published a splendid edition of his works, leaving out a comedy, which, on account of its licentiousness, had been objected to, and he also omitted to insert his speech against occasional conformity. He now felt reconciled to the measures of government, and to the change in the succession, which formerly he had regarded with horror. He went to court, and was graciously received by queen Caroline, to whom he presented his works, with some elegant lines written in a blank leaf. He died Jan. 30, 1735, in his 64th year. In private life, lord Lansdown was amiable, polite, and candid. He was liberal in patronizing literary merit, and had the credit of being one of the first to recognize the rising powers of Pope, who repaid him for his kindness by his dedication of *Windsor Forest*.

Forest. His own talents, as a poet, were not of the first order, but his works are still read with pleasure. He is chiefly known as a writer of amatory pieces, most of which are addressed to Myra, the countess of Newburgh, the object of his youthful passion. These are not either highly poetical nor strongly expressive of feeling. Johnson characterizes his "Essay on unnatural Flights in Poetry," as possessing didactic merit, and his "British Enchanters," as lively and pleasing. He seems to think favourably likewise of his epilogues and prologues. Biog. Brit. Johnson's Lives of the Poets.

GRANVILLE, in *Geography*. See GRANDVILLE.

GRANVILLE, a county of North Carolina, in Hillsborough district, S. of Virginia, containing 14,015 inhabitants, of whom 6106 are slaves. Its chief town is Williamsburg. —Also, a township of the county of Annapolis, in Nova Scotia, N. of Annapolis river, on the bay of Fundy, 30 miles long; first settled from New England. —Also, a township of Hampshire county, Massachusetts, about 14 miles W. of Springfield; incorporated in 1754, and containing 2309 inhabitants. —Also, a post-town in Washington county, New York, containing 3175 inhabitants.

GRANVILLE, or *Greenville*, a flourishing town in Mecklenburg county, Kentucky.

GRANVILLE'S *River*, a river of the island of Egmont, or New Guernsey, which runs into the sea, S. lat.  $10^{\circ} 42'$ . E. long.  $163^{\circ} 58'$ .

GRANULATED OIL. See OIL.

GRANULATION, in *Chemistry*, an operation performed on metals, whereby they are reduced into small grains or globules.

It is done by melting them, and when in fusion, casting them from a certain height into cold water; in which they congeal into granules, as required, and are hereby rendered more easy to be dissolved. The best way is to pour the fluid metal through a cullender, or a new birchen broom, or to agitate the water with a broom, thus giving it a circular motion while the metal is poured in. Copper is granulated for making brass in a cylindrical wooden reservoir, four or five feet deep, in which a circular brass or copper bottom may be raised or lowered by means of a chain. The reservoir is covered with a copper lid, in the middle of which is a hole half a foot in diameter, intended to receive an iron ladle pierced with holes and coated with clay. The reservoir being filled with water, the melted copper is poured through the holes in the ladle into the water; where it is broken by its fall into smaller drops or grains, rendered solid by the cold water, and collected in the moveable bottom, which is raised by the annexed chain, that the granulated copper may be taken out. Macquer, Dict. Chem. Eng. edit. art. *Brass*. See BRASS.

Lead, tin, and brass, which are very brittle, when they are so hot as to be almost fused, may be granulated by pouring them, in a state of fusion, into a box, the inner surface of which is rubbed with powdered chalk, and by shaking the box: the metals in the box are no sooner become solid, and consequently very brittle, than they are shivered, by being dashed against the sides of the vessel into a fine dust. Silver and gold, and the more tenacious metals, must be granulated in either of the first methods above-mentioned, with water. Cramer, Art of Ass. p. 70.

The term granulation is also applied to *gun-powder*: which see.

The granulation of common fowling shot consists merely in causing the fused metal to fall in equal spherical drops into water. The lead is melted with the addition of a small

proportion of arsenic, which being reduced to a metallic state, by means of grease stirred in during the fusion, renders it less fluid. An oblong shallow vessel of iron, perhaps 10 inches wide, 14 long, and  $2\frac{1}{2}$  deep, called a "Card," whose bottom is pierced with holes, proportionate to the size of the shot, is placed at the height of from one to three inches, over the surface of a tub of water, covered with a thin film of oil. The card is previously heated to the temperature of the metal, by immersing it in the cauldron; and a stratum of soft dross or scoria, found on the surface of the fused alloy, is then placed on its perforated bottom, and being slightly pressed down with the ladle, forms a kind of filter, which partly chokes up the apertures, and prevents the metal from flowing through them in continuous streams. The fused metal is then poured by ladle-fulls into this vessel, and appears, notwithstanding, to run through it with considerable velocity; so that it seems difficult to believe, that it falls in separate drops, till one is convinced by taking up a quantity of shot from the bottom of the water. The imperfections to which this shot is subject, are remedied in the patent shot, the manufacture of which differs from that of the preceding kind, in the addition of a larger portion of arsenic, which varies according to the quantity of the lead, in dropping it from such a height, that it becomes solid before it enters the water, which is from 40 to 100 feet. Besides, it is first dried and sifted. It is then *boarded*, which consists in feathering it on several polished slabs, or trays of hard wood, with rims in the form of a H, except that the sides converge towards the lower part, to which a slight inclination and alternate motion in their own planes are given by boys employed in the manufacture. The shot, whose form is imperfect, are detected by the sluggishness of their motion, and remain behind, whilst the others roll off from the board. The last operation is the *polishing*; which is performed by agitating the shot with the addition of a very small quantity of black-lead, not exceeding two spoonfuls to a ton, in an iron vessel, turning on an horizontal axis, like a barrel churn. It does not appear that any higher degree of perfection than that which is thus attained remains to be desired. The argentine brilliancy of the shot when newly made, the beautiful accuracy of its form, and the curious instance of inanimate tactics which it presents when scattered on a plate, renders it even an agreeable object of contemplation. Nicholson's Journal, vol. I. 4to.

GRANULATION. In *Surgery*, granulations are the small eminences of new animal matter, with which the cavities of sores and wounds become filled up in the process of healing. Granulations, according to Mr. Hunter, are formed by an exudation of the coagulating lymph from the vessels, into which new substance the old vessels very probably extend, at the same time that entirely new ones are generated in it. Hence granulations are exceedingly vascular, perhaps more so than almost any other animal substance. Mr. Hunter informs us, that he noticed upon a sore a white substance, exactly similar in every visible respect to coagulating lymph. He did not attempt to wipe it off, and the next day of dressing he found this very substance vascular; for, on touching it with a probe, it bled freely. He observed the same appearance on the surface of a bone that had been laid bare. He once scraped off some of the outside of one of the bones of the foot, in order to see if the surface would granulate. The following day he remarked, that the scraped part was covered with a whitish substance, having a tinge of blue. When he passed his probe into it, he did not feel the bone bare; but only its resistance. He conceived this substance was coagulating lymph, thrown out in consequence of inflammation,

## GRANULATION.

inflammation, and that it would be forced off when suppuration came on; but on the succeeding day he found it vascular, having all the appearance of healthy granulations.

The vessels of granulations first pass to their basis from the original parts, whatever these may be, and then run in nearly parallel lines to their external surface, where they seem as if they ended.

The surface of the new substance continues to have the same disposition for the secretion of pus, as the parts from which it itself was produced. Granulations are very convex, which is an appearance the very reverse of what happens in ulceration, or while a sore is increasing in size. They appear rough, in consequence of having a great many points or small eminences, and they are deemed the more healthy, the smaller such points are.

Healthy granulations are of a deep florid red colour, a circumstance which might lead one to suspect, that the colour was principally owing to the arterial blood; but Mr. Hunter was of opinion, that this appearance only denoted a brisk circulation in the new-formed substance, the blood not having time to become dark.

When granulations are naturally of a livid red, they are commonly unhealthy, and shew a languid circulation. Such appearances may often be induced by position, and we frequently see it take place on sores of the leg, when the limb is not kept in a horizontal posture. In this circumstance, the new-formed vessels are incapable of supporting the increased column of blood, and of acting upon it. The stagnation allows the change of colour to happen, and the alteration, in all probability, takes place both in the arteries and veins. Here may be seen the reason why sore legs are frequently very backward in healing, when the patient is suffered to put his foot on the ground, or to walk about.

Healthy granulations, situated on an exposed or flat surface, rise nearly even with the surface of the surrounding skin, and often a little higher; and in this state they are always of a florid red colour. When they exceed this height, and assume a growing disposition, they are then unhealthy, and they become soft and spongy, without any disposition to form skin.

Granulations always have the same disposition as the parts upon which they are formed; and take on the same mode of action. If it is a diseased part, they are diseased; and if the disease be of any specific kind, they are also of the same nature, and, of course, produce matter of the same quality.

When granulations are healthy, they are always prone to unite with each other, the great use of which is to bring about the union of parts, somewhat like what is the result of union by the first intention. See WOUNDS.

The disposition which granulations have to unite with each other upon coming into contact, without the appearance of any intermediate animal substance, is perhaps effected, as Mr. Hunter conjectures, in the following manner. When two sound granulations approach together, the mouths of the secreting vessels of the one coming to oppose the mouths of similar vessels of the other, they are stimulated into action, which is mutual; so that a kind of sympathetic attraction takes place, and as they are solids, the attraction of cohesion is established between them. This has been termed inoculation. The vessels thus joined are altered from secreting to circulating. There are some other surmises hazarded by Mr. Hunter respecting the rationale of this minute process of nature; but the curious reader must refer for them to the author's own relation of the subject.

Mr. Hunter informs us, that he has seen two granulations on the head, *viz.* one from the dura mater after trepanning,

and the other from the scalp, unite over the bare one, which was between them, so strongly in twenty-four hours, that some force was required to separate them, and when separated, they bled.

The inner surface of the skin, in cases of abscesses, not only does not readily granulate, but does not readily unite with the granulations underneath. Hence the frequent formation of fistulae and sinuses.

Unhealthy granulations have not an equal tendency to unite with each other: a smooth surface is formed, which continues to secrete matter. Thus, Mr. Hunter regarded the internal surface of a fistulous ulcer as, in some degree, similar to the inner surface of the urethra, when it is forming the discharge commonly called a gleet. Such sores have no disposition in their granulations to unite, and nothing can produce an union between them, but altering the disposition of these granulations, by exciting a considerable inflammation and probably ulceration; so as to form new granulations, and by this means give them a chance of falling into a sound state.

It is also noticed by Mr. Hunter, that granulations are not furnished with so much power as parts possess, which are originally formed. Hence they more readily ulcerate and slough. He states, that they not only shew the condition of the part in which they grow, or the condition in which they are themselves, but also, how the constitution is affected by many diseases.

The same author has made some observations respecting the longevity of granulations. He says, that they often seem to be formed with only stated periods of life, and those much shorter, than the life of the part, on which such granulations are situated. Their life, indeed, does not appear to be so short, when cicatrization can be accomplished; but while a sore is in a granulating state, they frequently perish without any visible cause. Thus, says Mr. Hunter, a person may have on his leg a sore, which granulates well, the granulations have a healthy appearance, the skin is forming round the edges, and every thing promises well, when, all at once, the granulations become livid, lose their life, and immediately slough off. In some instances, they are destroyed, partly by ulceration, and partly by mortification. Then new granulations are frequently produced, and go through similar changes. Sometimes this happens three or four times in the same person. Mr. Hunter in vain tried various methods for rendering the granulations in such cases more durable.

Suppuration and granulation are essential for the cicatrization and union of almost every wound, which has not been united by the first intention; a few small wounds and scratches, which heal under a scab, being the only exceptions.

Our author, in the following section of his treatise on the blood, notices, that cicatrization seems to be in view immediately after the granulations are formed. The parts which had receded, in consequence of a breach being made in them, by their natural elasticity, and, probably, by muscular contraction, now begin to be brought together by this new substance, which soon contracts. The contraction takes place in every joint, but principally from edge to edge, which brings the circumference of the sore towards the centre, so that the sore becomes smaller and smaller, although little or no new skin may be formed.

The tendency in the granulations to contract is, in some degree, proportioned to the general healing disposition of the sore, and the looseness of the parts, on which they are formed. When new skin cannot be produced, the granulations



do not so readily contract, and, therefore, Mr. Hunter infers, that their contraction and the production of skin are probably effects of one cause. The induration, occasioned by inflammation, retards the contraction of granulations, though Mr. Hunter was inclined to think, that the circumstance did not arise so much from a mechanical principle, as from the diminution of the disposition to the process occasioned by the inflammation itself. Granulations, however, as the same writer explains, are sometimes undoubtedly retarded in their contraction by mechanical causes, when formed on parts naturally fixed, such as a bone; for instance, on the skull, the shin, &c.

When, by reason of a loss of substance, there is a deep hollow sore, and the contraction of the granulations is considerably advanced, before they have had time to rise as high as the skin, the edges of the latter part are generally drawn down, and tucked in by it, in the direction of the excavated surface of the sore.

If it is a cavity or abscess, which is granulating, with only a small opening, as often happens when the surgeon has neglected to make a free aperture, the whole circumference contracts, like the bladder of urine, till little or no cavity remains; and if any cavity is left, when the granulations can contract no further, they unite with such as are opposite to them.

This contraction in the granulations, says Mr. Hunter, is continued till the whole of a sore is healed, or skinned over; but it happens in the greatest degree in the beginning, when there is less resistance in the surrounding parts.

The contraction of granulations may often be assisted by art, namely, by using bandages, which tend to push, draw, or keep the skin near to the sore which is healing.

Besides the contractile power of the granulations, there is a similar power in the surrounding edge of the cicatrizing skin, which assists the contraction of the granulations, and is even more considerable, drawing the mouth of the wound together like a purse, and sometimes, when the surface of the sore is high, grasping the granulations.

The contractile power of the skin is chiefly confined to the very edge, where it is healing. The surrounding old skin either does not contract at all, or not much, as is evident from its being thrown into folds and plaits, while the new skin is smooth and shining. The original skin, having little or no power of contraction, is a reason why round sores cannot so readily heal as long ones.

Mr. Hunter has explained, that the uses, arising from the contraction of granulations, are various. It facilitates the healing of a sore, as there are two operations going on at the same time, *viz.* contraction and skinning. It avoids the formation of much new skin, an effect which is very evident in all sores which are healed, especially in found parts. When a thick thigh, seven or eight inches in diameter, has been amputated, the surface of the sore is of the same width; yet, in the end, the cicatrix will be no broader than a crown-piece, in consequence of the old skin becoming drawn over the ulcer, by the contractile power of the granulations. The advantage of this is considerable, since such parts as are originally formed are always much fitter for the purposes of life than those which are newly formed.

After all, a sore is covered with skin, the substance, which is the remains of the granulations on which the new skin is formed, still continues to contract, till hardly any thing more is left than what the new skin stands upon. This is a very small part, in comparison with the first formed granulations, and, in time, it loses most of its apparent vessels, becoming white and ligamentous. All new-healed sores are at

first redder than the common skin, but afterwards become much whiter.

As the granulations contract, the surrounding old skin is stretched to cover the part which is deprived of integuments. At first, the skin is brought little further than into the position from which it had receded, on the occurrence of the wound; but afterwards it becomes drawn much more considerably, being stretched and elongated. See Hunter's Treatise on the Blood, Inflammation, &c. chap. 7.

GRANULES, in *Geology*, is a term which Mr. Whitehurst, ("Enquiry," 1st edit. p. 185) and others, employ to express the grains or minute lumps of stony matter, composing the sand usually found on the surface of valleys, and which is formed by attrition and the grinding down of stones of different kinds.

GRANULOSE Roots, are those composed of smaller knobs than the grumose ones, and resembling so many grains of corn; of this sort is the white saxifrage.

GRANUM VIRIDIS, in *Botany*, a name given by some authors to the turpentine-tree. The fruit of this tree is reddish while unripe; but as it ripens, it becomes of a deep blueish-green colour, and hence the name.

GRANZA, in *Geography*, a town of Africa, in the country of Magadoxa.

GRANZOW, a town of the Ucker-Mark of Brandenburg; 8 miles S. E. of Prenzlau.

GRAO, a port of Spain, in Valencia, which carries on a coasting trade along the Mediterranean; on one side, on the coasts of Catalonia, Roussillon, Langueadoc, as far as Marseilles; and on the other side, to Alicante, Carthagena, and Malaga: some vessels even pass the straits of Gibraltar, into the Atlantic, and go to Cadiz; and sometimes they go round Portugal as far as the ports of Galicia. The largest of these ships are from 50 to 60 tons, each having a crew not exceeding 11 men. They carry out wines, silk, wool, dry fruits, and kali; and return with linen, woollens, ironmongery, spices, and corn. Grao is pleasant in summer, on account of the sea-baths, which draw together a great number of people for health or amusement.

GRAPE, the fruit of the vine. See VINE and WINE. See also CURRANTS and RAISINS.

GRAPE Hyacinth. See HYACINTH.

GRAPE, *Mangrove* or *Sesuvium*. See COCCOLOBA.

GRAPES, *Wolf*. See LYCOSAPHYLAE.

GRAPE-galls, in *Natural History*, a name given by authors to a species of protuberances, resembling clusters of grapes, and when ripe of a reddish colour, which are found hanging from the oak at some seasons of the year. These are genuine galls, though of a peculiar kind, and owe their origin to a very small four-winged black fly. See GALLS.

GRAPE-shot, in *Artillery*, is a combination of small shot, put into a thick canvas bag, and corded through together, so as to form a kind of cylinder, whose diameter is equal to that of the ball adapted to the cannon. The number of shot in grape varies according to the service or size of the guns: in sea-service nine is always the number; but by land it is increased to any number or size, from a canee and a quarter in weight to three or four pounds. In sea-service, the bottoms and pins are made of iron, whereas these used by land are of wood.

GRAPE-stone, Botrites, is a sort of stalactites, which effervesces with acids, according to Dr. Grew. "Rarities of Gresham College," p. 324. It is also the name of certain botroidal stalactites, which are sometimes met with, pendant from the roofs of caverns in lime-stone districts.

GRAPES, in the *Mane.* a term used to signify the arrets or mangy tumours that happen in a horse's legs. See ARTERS.

**GRAPHICAL PERSPECTIVE**, in *Optics*, is an instrument described by Mr. Martin, consisting of a tube containing two convex lenses, which are placed at twice their focal distance from each other; and in their common focus is another glass, divided into equal parts with the point of a diamond. Though this instrument does not magnify any object, yet the angle under which an object is seen is easily known by it; and since this angle varies with the distance of objects, it is easily applied to the purpose of measuring inaccessible heights and distances; and since the field of view is divided into equal squares, it is useful in drawing the perspective appearance of objects. Moreover, as all foreign light is excluded by the tube in which these lenses are inclosed, pictures seen through it have a fine relief, on which account, and also because objects appear inverted through it, the images of a camera obscura are viewed with it to peculiar advantage. If a lens of a greater focal length be fixed at a proper distance from the centre of the tube, this instrument will be a telescope, and will magnify the prints which are looked at through it; and if a small lens be used, it will be a microscope, and the same micrometer will serve for them both. Martin's *Optics*, chap. xvii. p. 280, &c.

**GRAPHIDA**, in *Natural History*, a name by which some authors have called the *merochthus*, or French chalk.

**GRAPHIS**, in *Botany*, from *γραφοεις*, to write, a name invented by Adanson, who is pleased to spell it *grafis*, and adopted by Ehrhart, for the various species comprehended under the *Lichen scriptus* of Linnæus, and which constitute the very distinct genus of *Opegrapha* in Acharius; see Eng. Bot. v. 25, 26. t. 1753, &c.

**GRAPHISCUS**, in the *Writings of the Ancients*, a name given to an instrument used for extracting darts from wounds. It is said to have been the invention of Diocles, and is described by Celsus.

**GRAPHITE**. See PLUMBAGO.

**GRAPHOIDES**, *γραφοειδης*, in *Anatomy*, an appendage of the bones of the temples, long, small, sharp, and a little crooked, like a cock's spur; called also *styloides*.

The same name is sometimes also applied to the musculus *gastricus*.

Likewise to an extension of the brain, resembling a writing pen.

**GRAPHOMETER**, a name which some authors, particularly the French, give to a surveying instrument, by us commonly called a *femeteirele*; which see. Mr. Nicholson, in the fifth volume of his "Journal," 8vo. has described, and illustrated by appropriate figures, a subterranean graphometer, invented by M. Komarowski, F. R. S. and presented to the National Institute of France. It is a simple construction of the common *theodolite* (which see), and is calculated to answer the author's intentions in operations like those of mining, where great accuracy is not required. In vol. i. of the same "Journal," we have the description of an instrument resembling a graphometer, invented by Cit. Carangeau, for determining the mutual inclination of the faces of a crystal, or its prominent angles; it consists of two concentric, equal quadrantal arcs joined by a hinge; to which are applied compass-legs or radii, capable of being shortened to apply to small crystals, &c. See **GNOMETER**. See also *Plate VI. Crystallography, fig. 93.*

**GRAPNEL**, or **GRAPLING**, on *Ship-board*, a kind of small anchor for boats or galleys to ride by. It differs from other anchors, as having four or five flukes and no snack, though there are some with three flukes, with which they use to sweep for lawfers or small cables. In men of war also, the grapnels, or at least a lighter kind of them, whose

flukes are furnished with strong barbs on their points, are used to be thrown into an enemy's ship, in order to catch hold of some of her gratings, rails, gun-wales, &c. this is done in order to boarding of her. They are particularly useful in fire-ships, and called fire-grapplings.

**GRAPPLE**, in the *Manege*. A horse is said to grapple with one or both legs, when he catches or raises them more hastily and higher than ordinary, as if he were curvetting.

**GRAPTOLITHI**, in *Natural History*, are the petrificata *fieta* of Linnæus and others; as dendritæ, landscape-marble, dendropotamites, &c. all which, according to Mr. William Martin, "Outlines," p. 8. should be excluded from the list of extraneous fossils.

**GRASS, GRAMEN**, in *Botany*, See **GRAMINA**.

To enumerate all the species of grass which are found growing naturally in England, would greatly exceed the bounds which can be allowed for this article; it will suffice, therefore, to mention a few species, which are either used in medicine, or cultivated as a pabulum for cattle; for there is scarcely a pasture in this country where great numbers of different species are not to be found intermixed. Mr. Ray has ranged them in the following order, *viz.* wheat-grass, rye-grass, darnel-grass, panick-grass, canary-grass, fox-tail grass, cat's-tail grass, hedge-hog grass, crested-grass, oat-grass, cock's-foot-grass, buck-grass, and millet-grass. These and other grasses Linnæus has arranged into distinct genera. See the following articles:

**GRASS, Arrow-headed.** See **TRIGLOCHIN**.

**GRASS, Bent.** See **AGROSTIS**.

**GRASS, Bird.** See **BIRD-grass**.

**GRASS, Canary.** See **PHALARIS**.

**GRASS, Capon's-tail.** See **FESTUCA**.

**GRASS, Cat's-tail.** See **PHLEUM**.

**GRASS, Clover.** See **TRIFOLIUM**.

**GRASS, Cock's-tail.** See **DACTYLIS**.

**GRASS, Cotton.** See **ERIOPHORUM**.

**GRASS, Couch.** See **TRITICUM**.

**GRASS, Crested.** See **DOG'S-tail-grass** and **CYNOSURUS**.

**GRASS, Dog's.** See **TRITICUM** and **AGROSTIS**.

**GRASS, Sea-dog's**, a name sometimes given to the double spiked fescue, or rye. See **SECALE**.

**GRASS, Dog's-tail.** See **DOG'S-tail-grass** and **CYNOSURUS**.

**GRASS, Fescue.** See **FESTUCA**.

**GRASS, Fox-tail.** See **ALOPECURUS**.

**GRASS, Goose.** See **ASPERUGO**.

**GRASS, Hair.** See **AIRA**.

**GRASS, Hare's-tail.** See **LAGURUS**.

**GRASS, Knot.** See **POLYGONUM**.

**GRASS, Knot, German.** See **SCLERANTHUS**.

**GRASS, Knot, Mountain, and Verticillate.** See **ILLECEBRUM**.

**GRASS, Love, or Quaking.** See **BRIZA**.

**GRASS, Meadow.** See **POA**.

**GRASS, Hard meadow.** See **CYNOSURUS**.

**GRASS, Millet.** See **MILIUM**.

**GRASS, Oat**, a name given to a species of the fescue. See also **AVENA**.

**GRASS, Panic.** See **PANICUM**.

**GRASS of Parnassus.** See **PARNASSIA**.

**GRASS, Pepper.** See **PILULARIA**.

**GRASS, Pudding.** See **MENTHA**.

**GRASS, Quaking.** See **BRIZA**.

**GRASS, Rattle.** See **PEDICULARIS**.

**GRASS, Rush.** See **SCIRPUS**.

**GRASS, Rye, or Ray.** See **LOLIUM** and **HORDEUM**.

**GRASS, Scorpion.** See **SCORPIURUS**.

- GRASS, *Scorpion*, *Moufe-ear*. See MYROSOTIS.  
 GRASS, *Scurvy*. See COCHLEARIA.  
 GRASS, *Shave*. See EQUISETUM.  
 GRASS, *Silk*. See APOCYNUM.  
 GRASS, *Sword*. See GLADIOLUS.  
 GRASS, *Trefoil*. See TREFOIL.  
 GRASS, *Vernal*. See ANTHORANTHEM.  
 GRASS, *Vetch*. See LATHYRUS.  
 GRASS, *Tip-top*. See SCORZONERA.  
 GRASS, *Whitlow*. See DRABA.  
 GRASS, *White-top*, *Rae-haved*. See SAXIFRAGA.  
 GRASS, *Warm*. See SPIGELIA.  
 GRASS, *Wreck*. See ZOSTERA.

GRASS, in *Agric. laws*, a general name applied to those herbaceous plants that are employed in the feeding and fattening of neat cattle, sheep, &c. It has been long since remarked in an able tract on the grasses of this country, "that much of our meadow and pasture-land may be rendered infinitely more valuable than it is at present, by the introduction of some of the best grasses which we possess; and that this is an opinion which has long prevailed among many of the more enlightened agriculturists of the present age, some of whom have endeavoured to excite the husbandman to collect and cultivate seeds of this sort, by writings fraught with the soundest reasoning; while others have attempted to attract him by the offers of well-deserved premiums; but that hitherto neither the writings of the one, however convincing, nor the premiums of the other, however alluring, have, as the author thinks, been productive of the desired effect." And "Mr. Stillingfleet says, it is wonderful to see how long mankind has neglected to make a proper advantage of plants of such importance, and which in almost every country are the chief food of cattle. The farmer, for want of distinguishing and selecting grasses for feed, sows his pastures either with weeds, or bad or improper grasses; when by making a right choice, after some trials, he might be sure of the best grass, and in the greatest abundance that his land admits of. At present, if a farmer wants to lay down his land to grass, what does he do? He either takes his seeds indiscriminately from his own foul hay-rick, or sends to his next neighbour for a supply. By this means, besides a certain mixture of all sorts of rubbish, which must necessarily happen; if he chances to have a large proportion of good seeds, it is not unlikely but that what he intends for dry land may come from moit, where it grew naturally, and the contrary. This is such a slovenly method of proceeding, as one would think could not possibly prevail universally; yet this is the case as to all grasses, except the daniel-grass, and what is known in some few counties by the name of the Suffolk-grass (*pra annua*); and this latter instance is owing, it is believed, more to the soil than any care of the husbandman. Now, continues he, would the farmer be at the pains of separating once in his life half a pint or a pint of the different kinds of grass-seeds, and take care to sow them separately; in a very little time he would have what would to stock his farm properly, according to the nature of each soil, and might at the same time spread these seeds separately over the nation by supplying the seed-shops. The number of grasses fit for the farmer is, he believes, small; perhaps half a dozen, or half a score, are all he need to cultivate; and how small the trouble would be of such a task, and how great the benefit, must be obvious to every one at first sight. Would not any one be looked on as wild, who should sow wheat, barley, oats, rye, peas, beans, vetches, buck-wheat, turnips, and weeds of all sorts together? Yet how is it much less absurd to do what is equivalent in relation to grasses?"

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It is also asserted by Mr. Kent, that meadow and pasture-land is oftener neglected than poor ground, notwithstanding it generally admits of a much greater proportion of improvement. The best grass cannot be collected at so great an expence; for he has seen a small spot of land in the middle of a large piece, which was laid down to grass fourteen years since, by the writer noticed above, upon an estate in Herefordshire, with some choice seeds, at the same time when the remainder of the field was laid down to common feeds; and that this spot is considerably better than the rest. From these experiments, and his own observations, he is clearly of opinion, that any person who has land cultivated for grass may improve it, by this method of laying down, to a much greater degree than he can in the common way. Dr. Anderson has likewise observed, in the second volume of his essay, that although it is probable, that some of the grasses that have been hitherto cultivated by the farmer are of the most proper kind for pasture; yet there is little reason to doubt but that many of the most valuable kinds for this purpose would admit of being cultivated with the same care as some of those are with which we are well acquainted, if they were properly separated from others, and cultivated with equal care. But so long as we shall remain ignorant of the peculiar qualities of each kind of grass, so as not to be able to distinguish the good from the bad, it is not surprising, that we should remain firmly persuaded that nature alone can provide valuable pastures, and that agriculture is so essentially necessary for bringing them to their ultimate perfection. For, if we allow our fields to remain uncultivated, without having sowed them with any kind of grass-seeds, it must ever happen, that the seeds of such grasses as are brought by the wind, or otherwise, from the neighbouring fields, will there take root, and in time establish themselves. And as it may sometimes happen, that some of the most valuable pasture-grasses may there abound; the field, in these cases, will become filled with their seeds, and in due time afford the most valuable pasture. But if bad kinds of grasses should abound in the neighbourhood more than the good, the field will as naturally become filled with the seeds of these useless plants. And as a number of these are hardy and abiding plants, if the field is once filled with them, the pasture will be, of consequence, always of little value, if it should be allowed to remain undisturbed for any length of time. Let the reader, therefore, consider how numerous the circumstances are that must accidentally concur together before it is possible to expect a very fine field of pasture-grass, if left to nature, and then he will perceive how improbable it is that all these should concur to produce their full effect in any one field whatever. There must be no roots of bad grass, nor seeds of robust annuals, in the soil when it is laid out from tillage; and the seeds of the most valuable kinds of grasses must be in the neighbourhood in such abundance as to fill the whole field sufficiently at once. Nor is this all. For as there is, no doubt, a considerable variety of valuable kinds of grass, some of which are naturally fitted to grow to perfection on one kind of soil, or upon that soil when in certain circumstances; while others would thrive best upon another soil, or upon that soil in certain peculiar circumstances; it would follow, that the very plants which are best adapted to flourish in the one, may be in at the first, should be found in abundance in the neighbourhood of the field. Neither must there be found near that, any sort of bad quick-growing plants, the seeds of which, by being blown upon the field, might suddenly rush up and suffocate in their infancy the tender and valuable plants. Nor must there be found any bad kinds of grass, that, by being established along with the good in

any proportion, might tend to diminish the value of the pasture.

Now, let any one reflect on the infinite diversity these few particulars may admit of, and think how utterly impossible it is that all the favourable circumstances, without any of those that are unfavourable, should concur in any one case, and he will acknowledge, that those who found their hope of obtaining the most valuable pastures only upon the fortuitous concurrence of all these circumstances, or who imagine that every pasture which is old null, on that account, of necessity be good, act in direct contradiction to the plainest dictates of reason and common-sense. For, although it should be allowed that the grasses hitherto cultivated are not of the most proper sort for forming good pastures, and that therefore, on some occasions, much better natural pastures may be met with than could be formed by means of any of these; yet it by no means follows from thence, that if the farmer were perfectly acquainted with the value and distinguishing qualities of each kind of natural grass, and knew the soil and culture that best agreed with it, the most proper manner of rearing it, and every other particular relating to the economy thereof, he might not perhaps have it in his power to form artificial pastures as much excelling the natural as these last at present usually exceeded the former. For were he possessed of the knowledge above supposed, he could at once fill the soil with the seeds of those valuable grasses which he knew were best adapted to it, and thus effectually exclude the admission of every useless plant, or pernicious kind of grass, that might be brought from the neighbouring fields by the wind, or other accidental causes.

Let us, therefore, instead of contenting ourselves on all occasions with such pastures or grass-lands as nature may afford, rather study to improve those that are indifferent, by endeavouring to obtain a knowledge of such plants as might afford the most valuable pasture, and cultivating these with assiduity and care. The inattention of the improving farmers in Great Britain to this subject has been truly amazing. But it is hoped the attempts that have been made by some late writers may have the effect of turning their attention to a subject of such great importance; with regard to which, they will then doubtless make many valuable improvements. It is, however, to be feared, that till some attempt shall be made to ascertain the particular qualities and peculiarities of the different kinds of grasses, the public will be often imposed upon by specious accounts of new grasses, which may be really possessed of few valuable qualities, and may very much tend to discourage the inquirer. It is consequently necessary, to strenuously endeavour to discover what are the particular purposes for which any one plant could be deemed valuable, and in what respects it might be looked upon as of no value at all: For, as there is no plant that can be alike useful on all occasions, if we lose sight of this most necessary distinction, it may often happen, that we may attempt to rear a particular plant for purposes which it was never fitted to answer; and our want of success in these trials may make it be entirely rejected, even in cases for which it was extremely proper and beneficial.

It is stated that ray-grass continues to be the only grass whose seeds can be purchased for the purpose of laying down meadow and pasture-land; and how inadequate that grass is for such a purpose is known to every intelligent farmer. Why indeed the *lolium perenne* (ray or rye-grass) should originally have been made use of in preference to all the other grasses, cannot, perhaps, be satisfactorily accounted for: most probably it owes its introduction to accident, or to its being a common grass whose seeds were easily collected, rather than to its being preferred from any investigation of

its merits compared with the others. However this may be, there appears to be no reason for excluding the others; for it would appear exceedingly improbable, that of upwards of a hundred grasses, taking the word grass in its strict sense, that are growing wild in this country, the Author of nature should have created only one as suitable to be cultivated for pasturage or fodder. Since this period, however, most of the natural grasses have been cultivated for the purpose of affording feed, which may be procured genuine from many feedsmen in most places. Taking it for granted then, that there are other grasses superior in many respects to the ray-grass, this question naturally arises—How comes it that they have not found their way into general use? To this it may be answered, improvements in any science, but more especially in agriculture, are slow in their advances; and perhaps no class of men adheres more pertinaciously to old prejudices than that of farmers, and the difficulty of distinguishing the grasses from each other has, too, no doubt, proved one grand obstacle: many of these plants are so much alike, that the most discerning botanist is often at a loss to know some of them apart: if so, how easily may the husbandman be deterred from the arduous task! There is another cause also which may have operated against their introduction: grasses, as well as other plants, have been frequently recommended from a partial and limited observation of them, by persons who neither knew them well as botanists or agriculturalists, or who have recommended them, merely to gain by the credulity of the public. But, perhaps, the chief reason has been, that persons who might be expected to make the improvements, have not had the means fairly put into their hands to make the experiment, there not having been any easy means of obtaining such sorts of grass-seeds as may be most suitable for the purpose. It appears, however, that in the herbage of good meadows, or grass-lands, there should be a combination of produce, batableness, and early growth. The first is, in most cases, the agriculturalist's grand object—and no wonder, since it is the quantity chiefly which enables him to pay his rent, and support his cattle: to obtain this, the judicious husbandman spares no expence in labour or manure. But it does not follow that produce is to be attended to solely, or that, for its sake, we are to cultivate rough cock's-foot grass, meadow-sweet, and such coarse plants. Grasses which have been recommended for being remarkably grateful to cattle, as the sheep's-fescue grass, or for the sweetness of their foliage merely, if they are found to be deficient in the grand article of produce, will never answer the farmer's or grazier's purpose, since to be a good meadow it must be productive. Cattle, in regard to food, doubtless have their particular likings, though we cannot properly judge of it, in which it may be necessary sometimes to indulge them; but this practice must not be carried too far; for as the farmer cannot afford to feed his ploughmen on pigs and poultry, neither can he indulge his cattle in general with the finer or more delicate hay or herbage. By the bye, we do not know but that the most productive grasses may also be the most nutritious, or that cattle will not as eagerly eat the herbage or hay made of the meadow fox-tail grass, as of the fine bent (*agrostis capillaris*), and procumbent trefoil (*trifolium procumbens*). Moreover, cattle are known frequently to thrive on food to which they are habituated by necessity, though at first they could scarcely be prevailed on to touch it. Persons, in making experiments, are very apt, as has been already observed, to conclude too hastily from the appearance which a plant assumes on its being first planted or sown; the most insignificant vegetable will often make a great show, when its fibres have fresh earth to shoot into;

but

but the trial comes when the object of our experiment has been in a meadow or pasture several years, when its fibres from long growth are matted together, and it meets with powerful neighbours to dispute every inch of ground with it: if it then continues to be productive, it must have merit. We see that lucern, when left to itself, is soon overpowered; if we sow broad-leaved clover, which is most undoubtedly a perennial, the first year we shall have a great crop of clover; let this field be left to itself, and the clover, like the lucern, will yearly diminish, not because it is a biennial, as some have supposed, but because plants hardier or more congenial to the soil usurp its place: this shews, then, that at the same time that we introduce a good plant, that plant must also be a powerful one, able to keep possession, and continue to be productive.

With regard to the second quality, or that of the cattle's thriving on the food they eat; this is, undoubtedly, of great consequence, and it is to be regretted that our knowledge of the most nutrient herbage is so limited: of those plants which have been cultivated, we are able to speak with some certainty; it is well known that clover, lucern, sainfoin, tares, and several other plants, have a tendency to fatten cattle; but what grasses, or other plants, which have not been subjected to a separate cultivation, have this particular tendency, remains to be ascertained by experiment. But as leguminous plants, in general, are found to agree with cattle, we may reasonably conclude that a certain quantity of them must be proper in pastures. Certain pastures are found to be more bateable or feeding than others; but whether this arises from situation, or their particular produce, remains also to be discovered by further observation.

Respecting the third quality, or the early growth of plants, as the farmers and graziers unitedly complain of the want of early herbage in the spring; those plants, therefore, which are found to put forth early foliage, and to be grateful to cattle, are deserving of great attention. As far as grasses are concerned, the sweet-scented vernal, the meadow fox-tail, the smooth and rough-stalked meadow-grass, will effect all that can be expected from those of British growth: much, very much, however, will depend on seasons: if the winter be very severe, or north-easterly winds prevail in the spring, grassy herbage will be backward: to counteract the bad effects of such seasons, our pastures should be warmly situated, not drenched with moisture, sheltered by thick hedges, and divided into small enclosures: in short, a set of enclosures should be formed for this very purpose, where there is a prospect of its answering the designs of the cultivator. But where early pasturage is the desideratum, other plants, as well as grasses, may deserve a place amongst them, as rib-wort, or rib-grass (*plantago lanceolata*), dandelion (*leontodon taraxacum*), broad-leaved clover (*trifolium pratense*), with many others of the same kind. And as an early herbage, though it is valuable for pasturage, is no less so for hay; by the middle of May at furthest, a meadow of this sort would be fit for mowing, and the second hay-making might commence by the time that hay-making usually takes place in the country. The writer has sometimes thought, but perhaps the idea is too speculative, that we ought to have two sorts of meadows, one for hay, the other for pasture; that our hay-meadows should consist entirely of grasses, and chiefly for this reason, that the hay would on that account be much sooner made; an object of consequence at all times, but more so when the process commences in May. In June and July the more powerful heat of the sun is able to excite the thick leaves and stalks of the more succulent plants; but, in the necessary prolongation of this business, the grasses must materially suffer. But

for the purpose of pasturage, the attention of the agricultor should be chiefly directed to such sorts of grasses as have the propensity of running to leaves, in preference to such as abound more in flower-stalks or stems.

The same writer states, that if we examine our meadows, pastures, and downs, we shall find them pretty much in a state of nature, and, excepting those pastures which of later years have been sown with ray-grass and clover, full of an indiscriminate mixture of plants, some of which afford good food, some good crops, others scarcely any crops at all: but that he may not be thought to speak at random on this subject, he will state a few facts to corroborate what he has asserted. His worthy and much-esteemed friend, Thomas White, esq. with a view to ascertain the produce of several downs and commons fed on by sheep, procured, from each of those under-mentioned in Hampshire and Sussex, a turf, which, though not more than six inches in diameter, and chosen indiscriminately, produced, on being planted in his garden, as follows:

#### Different Turfs.

*Turf from Selborn-Common.*—*Plantago lanceolata*, *agrostis capillaris*, *avena flavescens*, *dactylis glomerata*, *festuca duriuscula*, *poa annua*, *cynofurus cristatus*, *trifolium repens*, *crepis tectorum*, *achillea millefolium*, *galium verum*, *hypochaeris radicata*, *hieracium pilosella*, *thymus serpyllum*.

*Turf from Oakbanger.*—*Trifolium repens*, *holcus lanatus*, *poa annua*, *agrostis capillaris*, *agrostis palustris*.

*Turf from D.ortun.*—*Ranunculus repens*, *lotium perenne*, *holcus lanatus*, *prunella vulgaris*, *festuca duriuscula*, *agrostis palustris*, *trifolium repens*, *crepis tectorum*, *achillea millefolium*.

*Turf from Glynd-hill.*—*Medicago lupulina*, *achillea millefolium*, *poa pratensis*.

*Turf from the same.*—*Avena flavescens*, *festuca duriuscula*, *festuca ovina*, *hieracium pilosella*, *agrostis capillaris*, *trifolium repens*, *thymus serpyllum*.

*Turf from Short-Heath.*—*Festuca bromoides*, *aira præcox*, *juncus campestris*, *poa annua*, *agrostis capillaris*.

*Turf from Mount Cabron.*—*Rumex acetosa*, *daucus carota*, *medicago lupulina*, *poterium sanguisorba*, *festuca duriuscula*, *avena flavescens*.

*Turf from Ringmer-Down.*—*Linum catharticum*, *scabiosa columbaria*, *ornithopus perpuillus*, *avena flavescens*, *festuca duriuscula*, *trifolium repens*, *hypochaeris radicata*, *crepis tectorum*, *lotus corniculatus*, *juncus campestris*, *hieracium pilosella*, *festuca ovina*, *thymus serpyllum*, *poa pratensis*.

It is, perhaps, no small recommendation to the *poa trivialis*, that it is a principal grass in that uncommonly productive meadow near Salisbury, mentioned by Stillingfleet, and more particularly described in the first volume of the Memoirs of the Bath Agricultural Society. And that the account given of the extraordinary fertility of this meadow excited his curiosity, and induced him to request a gentleman residing near the spot to favour him with six small turfs, cut up in different parts of the said meadow, and which being planted in his garden, at Lambeth-Marsh, produced as follows:

#### Different Turfs.

*Turf 1.*—*Poa trivialis*, *ranunculus acris*, *triticum repens*, *agrostis palustris*.

*Turf 2.*—*Poa trivialis*, *alopecurus pratensis*, *triticum repens*.

*Turf 3.*—*Poa trivialis*, *agrostis palustris*.

*Turf 4.*—*Poa trivialis*, *triticum repens*, *penicillaria blava*.

*Turf 5*.—*Poa trivialis*, *alopecurus pratensis*, *agrostis palustris*, *avena elatior*, *triticum repens*.

This experiment proves, in a great degree at least, what he long before suspected, that the extraordinary fertility of this meadow arose not from any new grass peculiar to it, but from several unusual circumstances concurring and favouring in an uncommon degree the growth of certain well-known grasses, especially the *poa trivialis* and *agrostis palustris*; consequently, in the forming and improving of grass-lands, the most certain plan will be to cultivate the seeds of such grasses as may be most adapted to them, and afterwards sow them at proper seasons upon the lands, when they have been put into a suitable condition for their reception.

The directions given are, that if a piece of ground can be had that is neither very moist nor very dry, it will answer for all the seeds; they may then be sown on one spot: but if such a piece cannot be obtained, they must be sown on separate spots, according to their respective qualities, no matter whether in a garden, a nursery, or a field, provided it be well secured and clean. Dig up the ground, level, and rake it; then sow each kind of seeds thinly in a separate row, each row nine or twelve inches apart, and cover them over lightly with the earth; the latter end of August or beginning of September will be the most proper time for this business. If the weather be not uncommonly dry, the seeds will quickly vegetate; and the only attention they will require will be to be carefully weeded: in about a fortnight from their coming up, such of the plants as grow thickly together may be thinned, and those which are taken up transplanted, so as to make more rows of the same grass. If the winter should be very severe, though natives, as seedlings, they may receive injury; therefore it will not be amiss to protect them with mats, fern, or by some other contrivance. Advantage should also be taken of the first dry weather in the spring, to roll or tread them down, in order to fasten their roots in the earth, which the frost generally loosens; care must still be taken to keep them perfectly clear from weeds. As the spring advances, many of them will throw up their flowering stems, and some of them will continue to do so all the summer. As the seed in each spike or panicle ripens, it must be very carefully gathered, and sown in the autumn, at which time the roots of the original plants, which will now bear separating, should be divided and transplanted, so as to form more rows: the roots of the smooth-stalked meadow-grass in particular, creeping like couch-grass, may readily be increased in this way; and thus, by degrees, a large plantation of these grasses may be formed, and much seed collected for the use of the agricultor. But a more ready way, according to a late writer, is, for the farmer to notice that species of grass most affected by his soil, and carefully to gather the seed from a piece of old meadow, purposely left three or four weeks longer than common, or at least long enough to become sufficiently ripe. He should not scruple the trouble of selecting the heads as they lie in the swath; but they who desire not to be so particular, will thresh out the seed together, either in the field or before it shall have heated in the mow. And good seeds of different sorts of grasses may now also be procured from different feedsmen in large towns and other places; but the collection sold under the title of hay-seeds should never be trusted to in any respect. Mr. Curtis, from the numerous applications that were made to him by gentlemen for grass-seeds, was induced to select such as appeared to him the most useful, and thereby rendered the public an essential service. He wished at least to put it in their power to decide on a matter which had been long agitated, and from

which he was far from being the only one that entertained the sanguine hopes of its proving a great national advantage. The grasses he has recommended will, he is confident, do all that our natural grasses can do: they are six of those which constitute the bulk of our best pastures; most of them are early, all of them are productive, and they are adapted to such soils and situations as are proper for meadows and pastures. But, let no one expect them to perform wonders; for after all they are but grasses, and as such are liable to produce great or small crops, according to particular seasons, or to the fertility or barrenness of the soil on which they are sown and cultivated.

This list comprehends the *anthoxanthum odoratum*, or sweet-scented vernal-grass; the *alopecurus pratensis*, or meadow fox-tail grass; the *poa pratensis*, or smooth-stalked meadow grass; the *festuca ovina*, or rough-stalked meadow grass; the *festuca pratensis*, or meadow-fescue grass; and the  *cynosurus cristatus*, or crested dog's-tail grass; of which representations may be seen at *figs. 1, 2, 3*, in *Plat. Grasses, Agriculture*, and *figs. 1, 2, 3*, in *Plate Grasses*; but more full accounts of them may be found by referring to their different botanical titles, in different parts of the work.

But of the above grasses, the meadow fox-tail and rough-stalked meadow grass are fittest for moist land; the meadow-fescue, or sweet-scented vernal, are the most proper for land either moist or moderately dry; and the smooth-stalked meadow-grass and crested dog's-tail are those that are best suited for dry pastures and other similar lands.

It is, however, supposed, that in the more southern parts of the kingdom we may in vain expect to clothe dry soils with the constant verdure of grasses; they will not stand the drought of hot parching summers: in such seasons, they are only plants which send down roots to a great depth that can be expected to look green or be productive, as the *lotus corniculatus*, *medicago falcata*, and some others.

The order of flowering in the above grasses is: 1. Sweet-scented vernal. 2. Meadow fox-tail. 3. Smooth-stalked meadow. 4. Rough-stalked meadow. 5. Meadow-fescue. 6. Crested dog's-tail.

It is observed that many more grasses might be added to this list, and those too which perhaps might be highly deserving of it; but he has his doubts, whether by recommending more he might not increase the difficulty of introducing grass-seeds without any adequate advantage in return.

But besides these, the *festuca ovina*, or sheep's-fescue grass; the *fistuca durinjula*, or hard-fescue grass; the *poa annua*, or flat-meadow grass; the *poa palustris*, or marsh-meadow grass; the *phleum nodosum*, or knot-grass; and the *blum feraceus*, or rye-grass, which is an useful grass in many cases; may all be employed with advantage. They may be seen at *figs. 1, 2, 3*, in *Plate Grasses*, and at *figs. 1, 2, 3*, in *Plate Grasses*.

And in the second volume of his *Essays on Rural Affairs*, Dr. Anderson has likewise given descriptions of many others, which, he conceives, may be beneficially employed in forming grass-lands, such as the *alopecurus bulbosus*, or bulbous fox-tail grass; the *fistuca rubra*, or purple fescue-grass; the *holcus mollis*, or creeping soft grass; the *plantago angustifolia* and *tenifolia*, or narrow-leaved and small grass-leaved plantain or rib-grass; and the *poa procumbens*, or creeping-meadow grass.

In a valuable "Essay on the Conversion of Grass-Land into Tillage," inserted in the Communications to the Board of Agriculture, vol. iii. part 1. the following detail of several plants of the grass kind is given, with the soils they



are most proper for, or on which they succeed to the greatest advantage.

“Ray-grass (*Lolium perenne*). This grass, which for many purposes is a very valuable one, is chiefly to be recommended for the two divisions of soil distinguished under the titles of loam and sand. It will flourish on any land, except stiff clay, and will grow even on that; but, upon rich sands and loams, it becomes not only a good spring-grass, but, if properly managed by due mixtures, turns out well as a permanent pasture-land; always, however, most valuable by being sheep-fed, for which it is singularly adapted. Mr. Peacey’s two varieties of it are said, by some persons who have tried them, to be superior to the common sort. Mr. Professor Martyn, he says, states the *cynosurus ceruleus*, *poa nemoralis*, *bronus mollis*, *alopecurus*, *anthoxanthum*, and *poa pratensis*, as all being earlier than the *lolium perenne*, or ray.” See *LOLIUM Perenne*.

“Yorkshire white (*holcus lanatus*). This, he observes, flourishes well on any moist soil, and grows very generally, except on the moist dry and barren ones, where, however, it is also found. It should be sown chiefly with a view to sheep, for it is not equally good for other stock; many acres of it have been cultivated on his farm for sheep, and it has answered greatly when kept close fed. Mr. Marshall, in his Midland Counties, mentions it as a good grass for cows and other cattle, but bad for horses. In his York Economy he, however, condemns it in toto; probably from not then having so closely remarked its qualities.” See *HOLCUS Lanatus*.

“Meadow-fescue (*festuca pratensis*). This is an excellent grass for good loams and clayey soils, and he has found it abound largely on dry loams. He has laid down some parts of fields with it for comparison with other grasses on wet sandy loams on a clay marble bottom, worth 14s. or 15s. an acre; but he found it giving way in four years to the plants more indigenous to the soil. He does not think there is any better grass for either hay or pasturage, and it yields feed in great abundance. He adds, that colonel St. Leger was, he believes, the first who entered largely into the culture of this grass; and Mr. Mjendie, of Essex, revived it, and began with the *alopecurus*.” See *FESTUCA Pratensis*.

“Meadow fox-tail (*alopecurus pratensis*). He thinks that for moist loams and clays, there cannot be a better grass than this: it is very early, and it abides on his farm after nine or ten years on the soils upon which the meadow-fescue gives way to others. It has also been found, by Mr. Mjendie, hardier against frosts than the *poa trivialis*: the greatest objection to it is the difficulty of getting the feed in any degree of plenty; there is an insect that feeds on it, and occasions much disappointment. Mr. Professor Martyn, in his excellent “Flora Rustica,” speaks, he observes, highly of this grass, and says the feeds may be collected without much difficulty; but he does not there advert to the insect which is so pernicious, as noticed by Mr. Mjendie, and by the ingenious Mr. Swayne, in his “Gramina Pastora.” In a field on his farm, where it is very well established, and the herbage thick, it produces very few seed-stalks.” See *ALOPECURUS Pratensis*.

“Crested dog’s-tail grass (*cynosurus cristatus*). It is remarked, that to judge from the appearance of the heads of this grass in poor upland but moist pastures, a man would think it a very unpromising plant; but the rich marshes of Bridgewater and Boston, the famous pastures of Plinton in Devonshire, and those close to Mr. Buller’s estate near Lestcard in Cornwall, Mr. Thomas’s bullock-ground, on a limestone bottom near Tavistock, Mrs. Williams’s at Little Malvern in Worcestershire, (which are among the richest

pastures in the kingdom), all abound, he asserts, very greatly in this grass; in some of them it is the predominant herbage. Mr. Marshall, in his York Economy, places it as the most prevailing plant in the best *oral-moors* of the vale of Pickering, some of which will feed a large cow from May-day to Michaelmas. Very fortunately it abounds much with feed, so that he has had many children gathered in a season by poor women and children, at one place a pound, and laid down many acres with it successfully. Attention should be paid to its being ripe; for he observes, that eight bushels to be for near eight acres, and it is a proof of deficiency in ripeness.” See *CYNOSURUS Cristatus*.

“Round-headed dog’s-tail grass (*astragalus*). It is observed that Mr. Bays, of Bathmore, in Kent, has been the largest cultivator of this grass in the kingdom, and sold large quantities of the feed, but gave it up for want of a demand. It is, he asserts, an excellent grass on good, sandy, and moist loams. It is accounted in London to be “the queen of meadow plants,” *the prince of all*, whether for dry pastures or water meadows; and it is valued much by feed, and little by the root; so that, if it is to be not paid to permit some feed to fall, its quantity will sensibly diminish. Excellent for all sorts of cattle.”

“This hint concerning the feed is worth attending to in England. Major Courtwright has found the *poa pratensis* to be an excellent grass on rich loams, and with feed good well with Mr. William Clayton, on the *poa trivialis*.” See *POA Trivialis*.

“Cock’s-foot (*dactylis glomerata*). This grass has been largely cultivated over the farms now managed on Lord’s satisfaction on wet loams on a clay marble bottom, upon which the finer grasses are apt to give way in a few years to the indigenous produce. If suffered to rise high, it is very coarse; but, fed close, is a very valuable sheep-pasture. Women and children make good dairies in gathering it at 4s. a bushel. He has sown two bushels an acre, and reaped common red clover; and when the clover wears out, the grass fills the land, and abides well in it. It grows well in winter. It has been found highly useful as an early sheep feed.”

It is stated in the Norfolk Report on Agriculture, that “Sir Mordaunt Martin, in 1788, observing, by an experiment, that this grass grew four inches in less than three days, determined to attend more particularly to it; he remarked, that when sheep were let out of a field, they run over every thing, to get at a bank that was full of it, and there ate it in preference to other grasses. In some parts of Norfolk it is called cow’s grass, from its being very fond of it. He began to cultivate it in 1790. It grows at Midsummer, in a drought, when every thing else is burnt up. He sows it with no seed, and it grows up, and finds it much more profitable.” And Sir M. Osmann, also, observing the experiment, which he saw made into a field at Burnham-market, that some cock’s-foot grass in it, ran over ray-grass, and every other grass, to get a bite of this plant, thought it worth cultivating, and sowed about an acre, on the dry gravelly part of his farm, just above the marsh. This spot was the only one in a large field, that did not burn in the year 1795, and he convinced him of the excellence of the grass, and also the good water “a beautiful crop of wheat, which could scarcely be estimated at less than 100 bushels, and a half per acre, pointed out a part of the water, if any thing, to the red; and said it was an excellent one on the cock’s-foot grass; he had found it a good plant for sheep, but having examined the roots, he thought them to be so strong, that he had some suspicion they might exhaust the soil.”

the land, and therefore sowed this piece for a trial: the result has satisfied him that all apprehension of the kind was ill-founded, and he intends substituting it for ray-grass." The author has also "cultivated this grass on a large scale for many years, and has found it of great use. It is a most valuable plant when kept close fed." See *Dactylis Glomerata*.

"Tall oat-grass (*avena elatior*). This is another coarse grass, profitable when kept close fed: the seed might be had in any quantity from France, or gathered by hand in England. In the Rev. Mr. Swayne's experiment, it yielded a greater weight than any other grass." See *AVENA ELATIOR*.

"Timothy grass (*phleum pratense*). This grass is represented by all travellers in America, he observes, as the great support of cattle, &c. wherever meadows are found; and it is asserted to have considerable merit. He has several times made the trial of keeping it close fed by sheep on a moist loam, upon a clay marle bottom. The success was very encouraging; enough, he thinks, to prove that it is an object, in this line of husbandry, which merits considerable attention; and the more, as the seeds are to be had, very clean dressed, in any quantity from America, at about a guinea a bushel; which is sufficient, with other plants, for four or five acres of land. He believes it is best adapted to clay, moist loams, and especially peat." See *PHLEUM PRATENSE*.

"Yarrow (*achillea mill. folium*). This, he asserts, is one of the most common and most valuable plants that is to be met with in England. On his farm the cultivation of it has been carried on with success as a sheep-pasture for some years. It is found on moist loams almost equally with dry burning sands, gravels, and chalks. It has a singular quality of resisting drought on the most arid soils; so that, if you see at a distance a green spot on a burnt-up, close-fed pasture, twenty to one but it is clothed with this plant. It is found in the richest meadows and bullock-pastures. Five shillings per bushel are given for gathering the seed in October: it is a plant deserving great attention. Sheep are very fond of it. It is said to form a fourth-part of the herbage of some of the fine meadows of Lombardy."

"Burnet (*poterium sanguisorba*). It is remarked that there are large tracts of the finest parts of the South Downs upon which this plant forms half the indigenous pasturage. It abounds much also on all other chalk downs; but it will flourish on any soil, on sand, clay, peat, &c. Some writers speak of it for cows: it has been cultivated on his farm these five and twenty years for sheep, for which animal it is very useful. The seed is to be bought almost every where." See *BURNET*.

And it is observed in the Agricultural Survey of Norfolk, that this plant was "introduced at Stoke 35 years ago, as the writer then registered, with great success; but it never made any progress, though it yielded luxuriant food for many horses in February." However, "the reputation of this plant attracted the notice of Mr. Coke, who formed an experiment at Holkham, to examine carefully its merits, and, with the spirit that characterizes his husbandry, sowed 20 acres, mixing a small quantity of white clover and rib-grass with it. The result was as decisive as can be imagined; the field has been fully and incessantly stocked with sheep, and was constantly paired as close to the ground, as a favourite spot in a pasture is by horses." And in other respects it is also valuable, as "Mr. Bevan has found it to be the most wholesome food for sheep in a wet spring, and a certain remedy for the flux." And he "is never without twenty acres of it."

"White clover (*trifolium repens*). It is asserted that this plant has hitherto been the main dependence of those who have laid down land to grass; and though, for sheep, it has not the sweetness of some other plants, or of red clover, yet upon the whole, it is one of the best that can be relied on for all rich or dry loams, sands, &c. and also for rich and drained clays and peats; but on poor wet loams and clays it will not abide, but gives way to the water-grass (*agrostis floumisera*) and noxious plants, or other indigenous grasses. There is no better test of good land, than its running spontaneously to this plant; from the fine loams on rock, upon the Tamar, to the deep friable ones of Leicestershire, red-clover, left unploughed, gives way to a thick covering of this plant. Whatever seeds be sown, this clover should form a part of the dependence for success. Mr. Bakewell, Mr. Wright of Norfolk, and several other practical farmers, made this observation, that stock has been known to do badly, though there was much food on the ground: perhaps that is precisely the reason; and that this plant, like so many others, demands very close feeding to discover its merit." See *CLOVER*.

"Trefoil (*medicago lupulina*). It is observed that, though only a biennial, it is sure to shed so much seed that it rarely wears out of land. It is a good plant, not at all nice in soil, and the seed cheap." See *TREFOIL*.

"Cow-grass (*trifolium medium*). An excellent plant for clays and strong loams. It is said, in the Lincoln Report, that Mr. Ancel got good crops on a rabbit sand; the hint is worth pursuing, but he has not seen it cultivated on such soils. It is much more abiding than common clover. The seed is always to be had: it is known also under the name of marle grass. Mr. Bakewell's method of laying down was, by common red clover and ray grass, being sure of plenty of white clover and good grasses coming: but he prepared by two crops of turnips in succession, and sowed with the barley following. On such land as his, the practice is not to be condemned, but on other soils it would fail entirely."

"Rib-grass (*plantago lanceolata*). It is asserted that upon rich sands and loams this plant gives a considerable herbage, and on poorer and drier soils it does well for sheep; but that it is inferior to some others. Mr. Marshall observes, that it has stood the test of years' established practice in Yorkshire, and is in good estimation; though not well affected by horses, and bad for hay, from retaining its sap. The eminent Haller informs us, that the astonishing richness of the famous dairies of the Alps, described by Scheuchzer, is attributed entirely to the plenty of this plant, and the *alchemilla vulgaris*. The seed is always plentiful." See *PLANTAGO*.

"Lucern (*medicago sativa*). This is more confined than any of the other plants. A landlord should, he thinks, only stipulate for it on very rich, deep, friable, dry, sound, mellow loams, and fertile sands, worth 30s. an acre. Upon such lands, he cannot do better than to encourage it among the tenantry, to be sown broad-cast, 20lbs. an acre, and to remain while productive, which will be from twelve to fifteen years. On such soils it will, he says, support more cattle than any other plant." See *LUCERN*.

But more full accounts of these grasses will be found under the different heads which are referred to.

With respect to *hay-seeds*, it is stated that the only case in which these are admissible is, when a person has a very clean and valuable meadow or pasture which he saves with a view for seed; drawing out the bad plants whilst the crop is on the swath, and threshing the produce on a cloth, after standing till the seeds be ripe. Thus managed, excellent seed may

may be procured with ease, and be beneficially employed in the forming of grass-lands.

In regard to the arrangement of these different grasses, as they relate to, or are proper for different sorts of soil, it is fully shewn in speaking of the methods of bringing land into the state of grass or sward. See *Laying LAND down to Grass*.

But besides the plants that have been noticed above, it is remarked that there are many others, some of which have been tried under his direction, which deserve much attention; but he has not named them in the above-mentioned list, because the seed cannot be procured but with difficulty: some perennial vetches, clovers, melilots, lotuses, &c. &c. And several others are highly spoken of by some writers; yet as his own trials have not been equally successful, he is not authorized to recommend them. He never tried the *vicia sepium* sufficiently, to give an opinion of it; but, by Mr. Swayne's account, it deserves much attention."

However, in considering the modes of laying lands to the state of sward, lists containing the proportions or quantities of different sorts of grass-seeds suitable for different sorts of land, are offered to the attention of the cultivator. See *Laying LAND down to Grass*.

It is remarked in a general way by the same writer "that if the land laid to grass be intended for sheep, it is not an object of very great consequence to sow only the finer grasses; as close feeding after the first year will make any grass named in the lists fine, sweet, and productive; but this effect depends altogether on its being constantly fed close, that is, all seed-stems being prevented from rising. Every good farmer is sensible of the necessity of this with ray-grass, but most unaccountably does not extend a similar concern to other grasses. Above 200 acres under the author's management have been laid down to grass, chiefly for sheep; and he has stocked the fields so early in spring, and so thickly, as just to keep down the seed-stems: the cock's-foot, oat grass, and Yorkshire white, with this management, have proved sweet feeding grasses, not at all rejected, even in fields where the flock had a choice. Several writers seem to have been very sensible of the consequence of close feeding. Mr. Davis, in the Wiltshire Report, says, "the sweetness of the feeds on the downs of Wilts depends much more on its being kept close, and eaten as fast as it shoots, than on any particular good quality of the grass itself; for there are many downs that, when close fed, appear to be a very sweet pasture, but which, if suffered to run a year or two without a full flock on them, will become so coarse, that sheep will almost as soon starve as eat the grass."

And in the Survey of the County of Stirling in Scotland, it is stated, that, upon Benlomond, &c. the pasturing of sheep has evidently, in the course of twenty years past, improved the quality of the herbage so as to raise grass of a good species, and in very considerable abundance, where nothing formerly prevailed but bad kinds of grass, and these in no great plenty: and the practice bids fair to banish heath from all the places that are pastured by sheep."

Further, Little, who was the best writer on husbandry we had for many ages, also remarks, "that there are poor soils which require a much longer time to grow a second inch than the first, and that consequently on such it is much more profitable to keep sheep than cattle." The writer, on first reading this passage, made the experiment on land of 12s. and 15s. an acre, clipping the plants with scissars, and carefully measuring and weighing the produce, and comparing it with neighbouring plants left to perfect the seed-stem; the superiority was proportioned to the times of cutting. Sheep-feeding not only, he says, ameliorates, by enriching the soil

and sowing the herbage, but also by destroying weeds. Ragnert, with which the bullock-grounds of Limerick, in Ireland, are overrun for want of sheep is, it is observed, much affected by them: and Mr. Marshall, in his York Enclosure, gives an instance of a meadow, foul in the extreme with knobweed, cured by pasturing it repeatedly in the spring with sheep. But here, a counter remark must be made, which is, that after a field has been pastured long with sheep, and close fed, it becomes unable to yield a growth of hay: the plants, by being constantly cropped down, acquire a dwarfish habit, however quick the growth in that early stage. There is a small field on the estate which he manages, which has been under grass, time immemorial, and kept fed for the last forty years at least, except one year in which it was mown, expecting a vast crop: the season was very favourable, but he was utterly disappointed, for the produce was small. He has known the same thing happen on enclosing an old common. In Scotland a similar remark has been made by Mr. Wight. "Two inclosures of the same soil were laid down together with grass-seeds of the same kind: after two years' hay, the one was surrendered to pasture; from the other a crop of hay was taken every other year. After seven years' absence, the proprietor returned home, and wanting more hay, mowed both, and that which had been pastured gave the worst crop." Something like the same thing has been observed in Switzerland, as stated in the Transactions of the Berne Society. It has occurred also in other instances.

With regard to the forming of grass or sward, the procuring of good seed has been found, from long experience in every part of the kingdom, to be of all other works the worst executed by tenants: they sow the cheapest seed, which can be procured, that is, common clover or ray, or the rubbish of their hay-lofts: the clover gives a crop the first year; but, as it wears out, all sorts of trumpery succeed, if the soil be not good enough to run spontaneously to white clover. Great care should therefore be taken by the owners of lands, which are to be brought into a state of grass, to have proper sorts of grass-seeds provided. About 25s. will purchase the seeds in most instances: the expence may be reckoned from 20s. to 30s. per acre; but depending on various circumstances, as the state of markets, and the price of labour. Of the seeds recommended, the following are to be bought in any quantity: cow-grass, Yorkshire white, Timothy from America, white clover, trefoil, ray, burnet, &c. And dog's-tail and cock's-foot are easily gathered by hand. Most of the grass-seeds that have been recommended as useful in forming good grass-lands may indeed, now, we believe, be had of the different seedsmen in London, and other places, as already noticed.

And the best methods of preparing the land, sowing the seeds, and managing the new grass-lands, are considered in treating of the practice of restoring arable lands to grass. See *Laying LAND down to Grass*.

*GRASS, Artificial*, a term signifying that kind of grass that is produced by the sowing of the seeds of different sorts of plants that have a quick and luxuriant growth on arable land; as those of the *red or broad clover, jointswain, lucern, trefoil, tare, rye, grass*, and other similar kinds. They are shewn at *figs. 1, 2, 3, in Plate Grasses* and at *figs. 2, 2, 3, in Plate Grasses, in Agriculture*.

There are likewise several other plants of this nature, that may in all probability be employed with great advantage to the same intention. And it has been stated by a late practical writer, that "though the chief hinge on which modern husbandry has been made to turn is that of the introduction of these sorts of grasses, it is extraordinary that they have yet, in but few districts, been made to constitute a part of

the course of cropping on arable land. In all well cultivated districts, they, however, form a considerable proportion of the crops. The first of the above is a most invaluable plant, whether it be mown and used green, pastured, or made into hay. By its long tap-roots it resists the effect of excessive drought on the dryed soils, and increases the quantity of vegetable mould in all. It will grow on most soils, but is not equally productive; and whether it be mown and used in the green state, pastured, or made into hay, it generally produces four or five times the quantity of fodder that the same land would have done with common grasses. Further, in good rotations, it frequently makes the second crop, in lieu of white corn mown once, and the after-grass eaten off with horses, beasts, or sheep, and the land sown with wheat. In that case, two pecks of the best ray-grass, mixed with fourteen pounds of the clover-feed, should be sown upon an acre, which not only increases the quantity, but also greatly improves the quality of the hay. If the clover is for stall-feeding, the ray-grass should be omitted. But in poor light soils, the better way is to take two or three crops of corn, and then to lay the land down to rest, three, four, five, or six years. In this case, it is advised that the farmer should sow the following feeds, in these proportions per acre:

Names of Seeds.	Quantities.
Of Burnet	4 pounds
— Cow red-clover	4 ditto
— White clover	8 ditto
— Trefoil	4 ditto
— Ray-grass	2 pecks
— Vernal grass	$\frac{3}{4}$ ditto
— Sheep's-fescue grass	$\frac{1}{2}$ ditto
— Cr. Red dog's-tail grass	$\frac{1}{2}$ ditto.

"It is supposed, that by this management, the soil would acquire a vast increase of vegetable mould, and, by the pasture maintaining one-fourth more stock than it did before, it would be greatly charged with manure; by which means the land would be kept in perpetual good condition: and, when brought under tillage, produce one-fourth more corn than it did under other circumstances." And it is remarked, in the Norfolk Survey, that "Mr. Purdis, of Egmore, was recommended by a friend, whose management he had seen and approved, to sow his seeds at twice: half of each sort (white and red clover, and ray) at the time of sowing barley; and the other half before the rollers in going over the young crop: and this practice he intends to pursue in future. He thinks it will give them a better chance of succeeding. He has 600 acres of feeds: he sows the great quantity of 14<sup>lb</sup>. an acre of white clover, 8<sup>lb</sup>. of red, and one bushel of ray-grass. The last he sows much in spring; and, when an observation was made against it, said, that in April and May he had three thousand sheep that found the excellence of it." This should be attended to by the farmer. It is also further stated, that, "in 1784, in registering the husbandry of that spirited cultivator of Holkham, it was remarked, that 'those who have been conversant in the husbandry of old improved countries, know that a common complaint is the failure of red-clover. It has been sown so repeatedly, that the land is said to be surfeited with it. In the same district it comes to nothing on the old improved lands, yet yields immense crops on any accidental spot, where never, or rarely, sown before.' The observation is so common, that no doubt can remain of the fact; however, it may be attributed to certain methods in management pursued in this county. Peas and tares had been tried as substitutes, but they are tillage-crops, and what their thin soils, harassed with the plough, want, is rest. Mr. Coke, it is added,

turned his views to a different and better quarter, to other artificial grasses, which would answer the same purpose as clover and ray-grass. He had recommended to him, on a former occasion, trefoil, white clover, cow-grass, rib-grass, and burnet. Mr. Coke applied them with no inconsiderable sagacity to the present purpose, and, that the experiment might not be delusive, tried them separately upon 30 acres in the middle of a large piece, laid with clover and ray-grass. The quantities of feed he has found will vary according to circumstances; but, in general,

Names of Seeds.	Quantities.
Of Cow-grass	8 to 10 <sup>lb</sup> .
— White clover	5 to 8 <sup>lb</sup> .
— Rib	5 to 8 <sup>lb</sup> .
— Burnet	5 to 12 <sup>lb</sup> .
— Trefoil	5 to 8 <sup>lb</sup> .

according to the price, and also the intended duration of the lay. The success of the first trial induced him to lay down a yet larger space the second year. And the third (with the barley of the last spring), no fewer than 221 acres: this is, in truth, says the writer, doing justice to a new husbandry. Mr. Coke has found that those lands fill the land completely with plants, which are abiding two and even three years: and how much longer they may last, is more than he can pronounce, as their appearance is yet as good as ever. The author rode over all the pieces, and never saw a finer or more regular plant than they exhibited. And he has, on several occasions, remarked, that sheep give a preference to these grasses, whenever sown in the same field with clover and ray-grass." And it is added, that "in regard to the continuance of these trials, some of the pastures now remain, and are as fine as the soil will yield: thick, clean, and sweet." and it is here remarked in regard to land being tired of this plant, that the observation he made, "during nine years that he was in the constant habit of viewing the farm of Mr. Arbutnot, in Surrey, merits some attention. When he began to farm, the land was sick of clover, inasmuch, that it was almost sure to fail, from having been, perhaps for a century, sown every four or five years. His friend adopted the course of—1. Beans; 2. Wheat; 3. Clover, in which it occurred once in three years, and the farmers predicted an absolute failure: he viewed three courses, and better crops, of pure red clover, were never gained. He began with ploughing treble the depth of that to which the land had been usually stirred, and he manured very amply for every crop of beans, partly with night-soil, from London. In what degree the success arose from depth of tillage, and what degree from a variation in manuring, cannot be ascertained; but the experiment proved that these agents were equal to the cure of the malady." It is also further noticed, that "some farmers in Norfolk have moved out of the common sphere, and ventured to plough deeper than their predecessors; nor have they found any inconvenience in so doing. It merits consideration, whether this practice will not prove in some measure a remedy to the failure of clover. As to manuring, and especially in great variations, the means are generally limited, and a change in this respect, however desirable, is rarely in their power." But, "the only effective remedy hitherto practised, is that of omitting clover altogether, for one or two rounds, which points out the great importance of introducing as many new artificial grasses as possible." See *Red Clover*.

The red-cow clover is another plant of the clover kind, which has been found very useful as an artificial grass. According to Mr. Amos it is perennial, and grows naturally in high chalky fields, and in gravelly fields with clay beneath. In the most improved part of the country, when the land is

to rest for some years, this seed is sown along with the white clover, as it continues in the ground much longer than the meadow-trefoil, and is nearly as productive, especially on chalky and poor sorts of land. And that where a crop of any of those clovers is taken in lieu of a crop of corn, the grain should be sown first, but less in quantity than if no seeds were sown with it; and, after the land has been made fine by harrowing and rolling them, fourteen pounds of clover-seed, and two pecks of best ray-grass, should be sown upon an acre bush-harrowed the length-way, and rolled the cross way of the ridges: afterwards the whole must be well gripped or drained. Nothing more is necessary to be done, on account of the seeds, till the next spring, when the land should be well dressed with the sward-dresser or harrows, drawn with long bushy thorns, the latter end of March, or the beginning of April; then cleaned and rolled the cross way again. In all these operations, the land should be neither too wet nor too dry, but in a due medium with respect to both these extremes, as, under other circumstances, they do not succeed so well.

The time for cutting those two grasses is, when they are in full flower, and rather shewing evidences of declining or passing their maturity. See CLOVER.

And the white clover is, in Mr. Amos's opinion, the sweetest grass for all sorts of stock yet known, and makes the clofett upward, and is very productive of foliage. Hence it is, he conceives it most peculiarly adapted to laying down land to pasture. It flourishes most upon rich, dry, warm soils; yet it will accommodate itself to moist kinds. It is seldom sown alone, unless it be to raise the feed; nor should it ever be mown for hay. In laying down rich soils, which are intended to remain in pasture for many years, this seed should predominate in the composition that is made use of. But in the Agricultural Report of Norfolk it is stated, that "Mr. Wright, of Stanhow, does not like white clover; he thinks it a bitter food, and that sheep do not eat it kindly; so that while much food seems to be on the ground, stock do badly. This is an uncommon opinion, but the writer remembers Mr. Bakewell starting the same idea." See *White Clover*.

The procumbent or hop-trefoil, is another plant of this sort, which is not very productive, and thrives best upon dryish gravelly fields, and pastures which have the same nature. They are both perennial. See TREFOIL.

Saintfoin is a plant of the artificial grass kind, which produces, Mr. Amos says, the best crops upon light rich land; but it will thrive upon the thinnest lime-stone, gravelly, and chalky soils, with great luxuriance, even where there are so poor as to afford a very scanty crop of any of the other sorts of grasses. It thrives best when sown alone, though it is frequently sown with barley and oats, by cultivators that have not much experience of it. And it is advised, that upon whatever soil it is sown, the land should be brought into a very fine and clean tith by culture. And, that about the latter end of March, or beginning of April, it should be ploughed, and if it is roughish, be harrowed once in a place; then upon every acre, sixteen pecks of saintfoin seed should be sown; then harrowing the land well, and sowing eight pounds of common red-clover or trefoil, upon every acre afterwards, the land should be bush-harrowed and rolled. And, where weeds appear, they must be destroyed as they come up, by hand, or other means. It is recommended, that no stock be suffered to graze upon the seeds the first year; and, that if it be top-dressed with one quarter of rape or bone-dust to an acre, about old Michaelmas, the plants are greatly invigorated and benefited by the application.

It is further stated, that, upon such lands as the above, it furnishes a crop of hay in summer of greater consideration than any other of the artificial grasses. The hay is excellent for all kinds of stock, and the after-math very good for cattle in autumn, and for sheep in winter, till Candlemas. Hence, saintfoin is a most invaluable grass on lime-stone, gravelly, and chalky soils; but it requires three years in coming to perfection; hence the propriety of sowing common red-clover or trefoil along with it. And it should be mown before it is in full blossom, otherwise there may be loss in that way. See SAINTFOIN.

Lucern is asserted, by the above writer, to be the most productive, and that which comes into use sooner than any other of the artificial grasses. Horses, beats, sheep and pigs, are very fond of it, when it is mown and given them green, which is the most useful application of it. It is found to thrive best on rich, dry, loamy soils, which should be made deep, fine, and clean of weeds by culture. And, he advises, that about the middle of April, ten pounds of seed should be drilled on an acre, in rows of eighteen inches asunder, and one inch deep, with a row of common red-clover between each; then bush-harrowed and rolled. Nothing more is necessary to be done till weed appear, when it should be hand-hoed well, and the weeds in the rows pulled out by the hand. As soon as more weeds appear, it must be hand-hoed and hand-weeded a second time, and even a third time, if necessary; when this is done, great care should be taken not to tread upon the young lucern. And as soon as it begins to blossom it should be mown, carried off, and given to the stock green. By this mode of application, it will, he says, keep more stock than any of the other grasses.

But this plant also requires three years in coming to perfection; hence the propriety of sowing common red-clover along with it. After that time, it may be mown three, four, or five times in a season. But, between every mowing, it should be well hand-weeded, and made quite clean of weeds. And every third year it should have a covering of rotten dung, after the rate of eight or ten tons to the acre, applied over it about Martinmas. See LUCERN.

Burnet is a grass of the artificial kind, of which there are several varieties; but the only one worth cultivation in this country is the common sort. This plant, though little cultivated, is highly valuable, either green or in hay for horses and cattle, and is an excellent winter food for sheep. It delights most in a dry, clean, light and deep soil; but it will grow very well on poor, gravelly, and chalky soils, which must be made clean and fine by culture. And it is advised by Mr. Amos, that, "about the middle or latter end of July the land should be ploughed for the last time, and harrowed well: after these operations, four pecks of seed should be sown broad-cast upon every acre, and then bush-harrowed and rolled. And it is suggested, that as the proper season for sowing it is the latter end of July, it becomes an excellent succedaneum to turnips, when they have been destroyed by the fly, which is often the case." And it is stated, that "the most profitable way of cultivating burnet is by sowing it with other seeds, when the land is to be laid down in these proportions:

Names of Seeds.	Quantities.
Burnet-feed	1 peck
White clover	10 pounds
Trefoil	4 ditto
Vernal-grass	$\frac{1}{2}$ peck
Ray-grass	1 ditto
Crested dog's-tail	$\frac{1}{2}$ ditto
Sheep's-fescue	$\frac{1}{2}$ ditto

The land should be bush-harrowed and rolled, and afterwards kept clean of luxuriant weeds. It is, however, remarked, that "much as this has been extolled, yet it is seldom sown either alone, or with other grass-seeds, since the introduction of red and white clover; though its greatest excellence is for winter-pasture in the feeds of sheep, &c." See BURNET.

Chicory is likewise a plant of this description, which may be found highly beneficial on many poor sandy or gravelly soils, where other sorts of grasses cannot establish themselves. It is asserted, in the Norfolk Report, that "Mr. Bevan sowed an acre of poor land, worth not more than 2s. 6d. rent, with chicory in 1793, and that the next year it produced 7l. 10s. in feed." And the writer says, that he has taken several opportunities of recommending this grass in that district. On large tracts of poor land, he is confident it would increase the produce tenfold; and it well merits trial, he thinks, on every soil in it. The objection which has been founded on its not being easily extirpated, is, he contends, of no importance, for tares should be sown after it on some soils, and turnips on others, in which system, its distinction is unquestioned. This hint should not slip the notice of cultivators in other districts.

*Summer Tare.*—This is a plant of the kind, which is much employed as summer herbage, either pastured or mown green, as soiling for horses, &c.; for hay, as a substitute for red clover (on land that has been tired of growing it); for manure to be buried in by the plough: and for feed: hence the season for sowing the seed of this tare will depend upon the use it is intended for. When for summer herbage, &c. it matters not how early the seed is sown, provided no hard frost ensue. The first sowing may be as early in February as the season and condition of the soil will allow, and to continue the sowing at due intervals through the months of March and April, which will give a good opportunity for successions of them, to the great convenience of summer-feeding, but when for depasturing, it will be prudent to wait till the tares have gained a sufficient increase of haulm, before the stock are turned in upon them. And when for soiling horses, &c. they should be mown before they flower; and in no instance should the haulm be suffered to become rotten near the surface of the ground, which frequently happens on rich soils and moist seasons. If for hay, as a substitute for red-clover, the seed should be sown as early in March as circumstances will allow; but the time of mowing is more optional. Some mow them when the blossoms are fuller; others, just before they are quite ripe. But, in either case, the same caution is necessary, as in making saint-foin and clover into hay; and that is, to avoid breaking off the leaves, in which a great part of their virtue resides. When they are intended for manure, the seed should be sown as early in February as the season and condition of the soil will permit, and at the rate of four bushels to the acre. For this use they should be ploughed in before they get too long in their growth. But whatever is the intended use in cultivating this tare, the preparation of the land is the same; and this plant delights most in light sandy soils: and, in every case the land should be ploughed and harrowed once in a place, before the seed is sown; then sow the seed broadcast at the rate of three bushels an acre for the first and second uses, harrow the land well afterwards, and then lay it dry.

"The great objects in cultivating this tare are, 1st, spring-food and summer-herbage for cattle and sheep, especially ewes and lambs. 2d, Hay, as a substitute for red-clover. 3d, Manure, to be buried in by the plough. And 4th, Seed. But whatever is the intended use of this tare, Au-

gust and September is the prime season for sowing the seed of it. As soon, therefore, as the ground can be cleared of its crop, the land should be ploughed and harrowed once in a place before the seed is sown upon it." And it answers extremely well simply as a spring-food, when sown with rye, in the proportion of six pecks of each to the acre. See TARE.

Where they can be cultivated, crops of this sort should never be neglected. See ARTIFICIAL Grasses.

*Grass-Ground*, in Gardening, the parts of ornamented grounds which are kept in the state of lawn short grass or sward. Those spaces which are extended in the fronts of the houses or habitations, and are termed lawns, are mostly kept in short grass, which, by their constant verdure, summer and winter, and open rural appearance, exhibit a fine imitation of nature at all seasons, especially when the side boundaries terminate in rural plantations in various natural curves and bendings. This mode of laying out pleasure grounds prevails much at present. But besides these it is the practice to have rural short grass openings continued between the plantations throughout the different districts of ground of this sort, separating and bounding the shrubbery clumps, borders, and other parts, in some places widely spreading, in others more contracted; but, in either case, extending to the boundaries of the several plantation compartments, in various bendings, sweeps, and curves; by which the whole is rendered rurally ornamental, and at the same time more agreeable and easy to walk on than gravel between the plantations, when the weather is dry and hot during the summer season. In the ancient style of gardening, it was much the custom to have straight short grass-walks, both for ornament and common walking upon: but for ornament, unless elegantly wide and spacious, they have a littleness in their general appearance, as may be seen where long narrow slips of short grass-ground are extended to some distance, in the way of walks; and for the latter purpose they are very improper in winter and all moist weather; and even in summer in the mornings and evenings, as being always damp and dewy. Walks of this kind should therefore be but sparingly introduced; and where any are made for variety, ornament, or summer's walking, they should be as spacious as the situation admits, not less than from ten to fifteen feet wide, and even twenty feet wide or more, when the walk is considerably extended in length.

The method of forming short grass-ground work is either by sowing the parts with grass seeds, or by laying them with turf cut from a fine field, common, or down; the latter of which, where it can be obtained at a moderate expence, is greatly preferable, as it not only at once forms a complete sward, but is generally more close, even, and smooth, as well as less apt to run up to benty grass, grow rank, or rise in tufts, than by the sowing method. The sowing method is, however, much less expensive.

*Preparations.*—In preparing the ground either for sowing grass seeds upon or laying with turf, the whole must be broken up equally to a moderate spade's depth, clearing out all the roots of perennial weeds and other coarse materials. When this has been done, flakes or wooden pegs with notches, for making the level, according to the position of the ground, must be driven in; then proceed with line and spade to rough-level the ground according to the marks or levels on the pegs, afterwards treading, rolling, or ramming the whole down equally, that it may nowhere sink in hollows afterwards. When this has been finished, the levels should be wrought up more accurately, and the whole finished with a neat raking, clearing off all large stones, and making an



even and smooth surface; in this state it may either be sown with grafs seed, or laid down with turf.

For the first method the proper seasons for sowing are either February, March, and April, or in August or September in moist weather. In moist wet soils the former is probably the best, but in those of a dry gravelly nature, the latter. In this business it is of the utmost consequence to procure good seeds; those from hay-stacks or out of hay-lofts are often used, which may answer well, where the hay was the growth of some fine pasture free from weeds, and naturally afforded fine turf when grazed and mowed; but in other cases there is often a mixture of various sorts with weeds, by which the sward is rendered irregular and foul, and never makes handsome short grafs-grounds. If you are not furnished with seeds of your own, they must be obtained from the seedsmen, and should be of those kinds which strike deep root, spread out laterally in their tops, are permanent, and capable of resisting the effects of heat; there are many of this kind. (See *Laying LAND down to Grafs.*) The seed must be sown broad-cast, very thick and regular over the surface, and directly raked or harrowed in; and when the surface is dry it should be rolled with a wooden roller, to bury the seeds more effectually, and make a smooth surface: when the grafs comes up, all weeds should be removed; and the same season, when the sward is become thick and green, and advanced some inches in growth, it should be mowed, rolling it well afterwards, and continue mowing it and rolling two or three times the first summer, especially if it were sown in spring, as, the oftener it is mowed and felled, the thicker and finer it will grow; and if it be intended to keep the grafs tolerably fine, mowing will be requisite once a week or fortnight, according to the growth from April to October, and rolling once a week or fortnight in moderately dry weather, and occasionally in the winter season. In this way a good turf may be formed in a few years.

In the second method, which should always be employed where it can with convenience, the best turf is that of a fine pastured common or down, where the sward is fine and short, with considerable closeness.

The best season for laying the turf is from September till March or April, though it will grow at almost any time of the year, even, if there be occasion, in the summer months.

The turf for this use is mostly cut or flayed with an iron instrument called a turving iron; all the turfs being cut of an equal width, length, and thickness; the proper size is a foot wide, a yard long, and about an inch in thickness. They should be first marked by a line the proper width, length, and depth, and then cut with a racer or cutter, first longways a foot wide, then across in yard lengths, proceeding afterwards to cut them up; having particular regard to cut them level, and all of an equal thickness, otherwise it will be impossible to lay them level. As they are cut they should be rolled each up close and tight, the grafs side inwards, and piled up by tens, especially if they are cut by the hundred, which is mostly the case. This is usually done at from about a shilling to fifteen pence the hundred, according to the nature of the soil, as, whether soft and easy to cut, or hard and stony. A man will cut from three to five, six, or seven hundred a day, with a person to trace them out and roll them up as they are cut from the surface.

The method of laying them is very easy: they are placed regularly turf and turf, unrolling them as they are laid, joining them up quite close edge to edge, and making good all deficiencies of broken parts as the work proceeds; and

as soon as laid, they should be well beaten with broad heavy wooden beaters, as flat pieces of elm or oak plank two inches thick, fifteen or eighteen inches long, and a foot broad, having long handles fixed slanting in the middle, or the upper sides. With these beat the grafs regularly all over, and then roll it well with a heavy iron or stone roller, repeating these operations in moist weather as there may be occasion.

When very dry hot weather succeeds, so as to occasion the turf to shrink and open at the joints, a good watering is of much advantage to it.

The management of short grafs-ground, after it has been thus laid down, is that of mowing it in summer frequently, to keep it short and fine, like a pastured down; poling occasionally with a long pole, to scatter the worm-casts, which greatly deface all short grafs, and rolling it frequently both to take up the scattered worm-casts to make the surface clean, and to render it smooth, firm, and even in its appearance.

Mowing once a week, ten days, or a fortnight, or, according to its general growth, during the summer, is necessary, especially for the principal home lawns, and other short grafs-grounds, in the moist conspicuous parts; which parts should always be kept very close and fine, like the sward of a fine pastured down or common: it is performed with a short grass-scythe; and dewy mornings, or moist weather, must always be chosen for the work, as it will be impossible to mow short grafs properly in dry weather. Previous to mowing, it is of advantage sometimes to pole and roll the grafs the day before it is intended to mow. In performing the work of mowing, proper attention is necessary not to score or leave the marks of the strokes of the scythe, which has a very unightly appearance; to prevent which, as much as possible, the point of the scythe should be laid out rather wide, an inch or two beyond the measure of heel and point, especially for very short grafs, keeping the point rather out, and not drawing that part too fast inwards, gathering the grafs neatly to the left in a range; and after having mowed thus to the end of the sward, to mow it lightly back again, in order to trim off all scores, and other irregularities, unavoidably left the first time in executing the work.

After it has been all thus mown over, proceed to sweep up the mowings of each sward regularly, by standing in the middle, sweeping it along alternately to the right and left, to the end of the sward, forming all the grafs in a range on each side; then sweep up the ranges in large heaps, and carry the whole off directly in a wheel-barrow, large basket, or other contrivance for the purpose.

The business of poling is performed by a long, taper, pliable, ash pole, fifteen or eighteen feet long, by passing it backwards and forwards, in rather dry weather, so as to break and scatter the worm-casts about. The grafs should be afterwards rolled with a wooden roller, when the surface is a little moist, but not too wet, by which the earth will all adhere to the roller, and render the surface perfectly clean, the work being repeated, as there may be occasion, the year round; and in mowing-time, if the surface is foul, it is particularly necessary to pole and roll on the day previous to mowing, by which a clean smooth surface will be provided, so as to be able to mow close, even, and more expeditiously. See *POLING*.

In the rolling of short grafs-ground, it should be performed occasionally with a wooden roller, and a heavy iron or stone roller: the wooden roller is proper after poling, to clean up the worm-casts and smooth the surface, being performed when the surface is not very wet, especially if full of worm-casts, as it would otherwise plaster and dash

the grass, and render it unfitly; the heavy iron, or stone roller, should be used occasionally, when the surface is dry, to press down all inequalities, so close as to preserve a firm, even, smooth surface. And in fine-kept short grass-grounds, the rolling should be performed occasionally a day or two before mowing, to settle the surface firm and smooth, which greatly contributes to the easy and exact performance of the work: the business of rolling in small, or but moderately large short grass-grounds, is mostly performed by men; but in very extensive grounds, it is sometimes done by a horse; having a large roller for the purpose, with shafts like a cart, and the horse at the time wearing a sort of leathern shoes, very broad at bottom, made so as to lace on occasionally, like mens' half-boots, to prevent his feet cutting the surface in holes, and rendering it uneven, and of a bad appearance.

Where short grass-grounds are defaced by wild daisies, dandelion, or other weeds, the first may be removed by having the blade of an old broad-sword fixed in the end of a long pliable pole, which, as it cuts both ways, by sweeping it backwards and forwards, it will head down the daisies at a great pace; which may be repeated two or three times a-week, or as often as there may be occasion for it.

The others should be extirpated by means of an iron for the purpose, made in the form of a small docking-iron.

In the autumnal finishing mowings, the grass should be generally cut down as close and even as possible, that the sward may remain in a neat even surface over the winter season, and appear well in the early spring.

These directions for the management of short ornamental grass-grounds, regard only such as are required to be kept constantly short, close, and even in the surface, as is necessary in the principal lawns, plats, walks, and other divisions, situated within the limits of the main pleasure-ground. In the outward considerably extended districts, continued into fields, parks, &c. it is not necessary to have them cut so frequently; two or three common mowings in a summer, with occasional rollings afterwards, may be sufficient.

*Grass-hearth*, in our *Customs*, *grazing*, or turning up the earth with a plough. Hence the customary service for the inferior tenants of the manor of Amerfsden in Oxfordshire, to bring their ploughs to do one day's work for their lord, was called *grass-hearth*, or *grass-hunt*.

*Grass Husbandry*, that sort of husbandry which has a relation to the management of grass-land, or such as are under the condition of sward. This, in a great measure, consists in the proper clearing, manuring, pasturing, or feeding down, shutting up, cutting or mowing, and the preservation of the crops. This sort of management is far from being perfectly understood in many parts of the kingdom, and consequently the grass-land is frequently in the most coarse and wretched state, being over-run with various kinds of coarse and aquatic plants, as well as those of the moss, and other descriptions. See *HUSBANDRY*, *GRASS*, *MEADOW*, and *PASTURE*.

*Grass-land*, that sort, or description of land, which is mostly preserved in a state of herbage or sward. The sorts of land that are the most adapted for this purpose are, according to some late writers,

1st. Such as are situated near large populous towns, where manure is cheap and plentiful, and where the produce of grass-land is constantly on demand, and, of course, dear.

2dly. Such lands as are placed on the banks of rivers and brooks, that may be improved by irrigation to a much higher value than can possibly be done under any other method of cultivation.

3dly. Such lands as lie in vallies of mountainous countries, especially chalky soils, where old meadow-land is

scarce and valuable, and the greater part of the arable land is of that nature and quality, that it is impossible to convert it to good sward-land. And

4thly. All such cold strong ground of the grass kind, which, if ploughed up, would not be applicable to the purposes of the turnip-husbandry, or those of modern farming, and which, under the best practice of wheat-husbandry, would not be so valuable as they are at present in the condition of sward.

The forming of grass-ground is effected with different degrees of difficulty in different instances; in some parts of the island it is accomplished, in general, with great care and facility, the soil having a natural tendency to the production of grass herbage, when left in an unploughed state, reverting to pasture without labour, expence, or even the sowing of seed; while, in other cases, all the art of man has been found ineffectual, to make good grass-land. Even after 20 years fruitless expectation and expence, the land-holders have often been obliged to restore the ground again to a state of tillage-husbandry.

It is remarked, that consequently the great difficulty in this business is to discriminate what sort of land is suitable and proper for grass, and that which is improper for the purpose. The best meadow-land does not always make the best tillage-land, nor does the best arable-land always make the best pasture, but frequently the reverse. To make this discrimination, it is necessary to consider well the process of nature in propagating and perpetuating grasses. The great object of nature is to perpetuate all her species; but upon the plants created for the support of animals intended for the food and use of man, she seems to have bestowed more than ordinary care. Different kinds of animals propagate in different modes, some ovariously and some vivariously. Plants having no locomotive motion are endowed with a power of propagating in both modes. In trees and shrubs, and many kinds of plants, the assistance of man is required to obtain vivarous production, by grafting, budding, &c. But, in grasses, nature does her own work, and that in both modes. We have only to attend to her examples, and we shall seldom err. In trees and shrubs, the bud is the vivarous production; in grasses, the root performs the same office. Grasses are as much the offspring of roots as of seeds. Every new root contains the germ of a future plant; and, as the seed-stalks of grasses must necessarily be frequently cropped by animals, nature makes up the deficiency by an increase from the roots. Most of the best grasses are, in their nature, biennial; but nature, by giving them the power of propagating by the root, has in effect made them perennial: a much more certain mode of propagation than by seed, as being increased instead of being injured by the biting and treading of animals, and by the produce being perfect in one year instead of waiting two, as in the production by seed. But this process does not go on successfully, unless the land is peculiarly apt for the production of grasses. If it is too wet, the grasses will be injured in the winter by rain and frost, and will soon be superseded by rushes and other aquatic plants: if too dry, they will be killed by the summer's heat, and give place to mosses, fern, heath, &c. No land will, it is conceived, make a good meadow, unless it is deep enough to admit the roots of grasses to run down out of the reach of the summer's heat, and that it be retentive enough to hold water just so long as to produce fermentation, with such an absorbent under-stratum as will drain it before putrefaction takes place.

Some proportion of grass-land should always be attached to every farm, in order that a proper and suitable supply of winter and summer food may be provided for such animals as

may be requisite in managing them, and also that adequate proportions of good manures may be raised; as, where this is not the case, it is impossible that farms can be well managed. And on all sorts of grass-lands, it is of much consequence to keep them as clear and free as possible from the growth of all sorts of coarse plants, those of the aquatic kind being removed by suitable drainage, and the application of different substances of the absorbent description to the surface of the land. They should likewise be carefully eradicated from the hedge-rows of grass-fields annually, and by that means be prevented from spreading themselves over the ground by their seeds. By this practice, the hedge-plants would also be greatly benefited. These sorts of lands should also be kept as clear as the nature of their application will admit, of all kinds of obstacles that impede the production of perfect sward, such as the growth of moss on their surfaces, and the continuance of cattle dung-hills, ant and mole hills, as well as those of sticks, stones, and other similar substances. The proper methods of removing these are noticed under their particular heads, and in speaking of meadow-lands, and pastures.

According to the Agricultural Survey of the County of Hertford, in harrowing, with a view to destroy moss, no benefit has been found to be produced, though the mossy material has been well torn up. It is advised that manure should be laid on at the same time: but that where ashes are spread out over the surface without harrowing, the moss plant is destroyed, and the grass greatly improved. And in other cases, much advantage has likewise been experienced from the application of fine sand over the sward, in an even but not too thick a manner. But the dung of animals should never be suffered to remain any length of time in heaps upon the surface of grass-lands, without being beat out small, and dispersed over the surface; as, wherever that is the case, the sward in the places becomes tender, and the grass comes up coarse and in tufts, which are not eaten by cattle stock, and of course much injury sustained.

In respect to the prevention of the rising of ant-hills on grass-lands, they may be in a great measure, if not wholly, guarded against, by having recourse to frequent heavy rolling; as, in the rolling down of ant-hills, instead of cutting them up, in an experiment made by the duke of Grafton, it was found to be attended with complete success, on a large pasture which had been very much infested with ants, and which they had almost covered with hills. But in such cases the rollings should be performed both in the autumn and spring seasons, when the lands are in such states of moisture as just to admit the impression of the roller without receiving injury from the feet of the horses; as, where such operations are executed when the grounds are in a state of considerable dryness, the benefits are comparatively small. The beneficial effects that are produced in this way depend much upon the degree of consolidation that is effected; as it is only by this means that the insects can be prevented from carrying on their operations; a certain state of lightness as well as fineness in the mould being essential to the execution of their labours in a perfect manner. But besides these, attempts have been made in other ways to prevent the formation of these hills. For as it has been seen that "the economy of the ant requires the situation and soil to be dry, light, and friable, in order to carry on their works, it is probable that, in lands that will admit of the practice, it may be an easy and convenient method of destroying them, and preventing the bad consequences which their labours produce on the surface sward, to conduct water over them; and thus, at the same time, exterminate the colonies of ants,

and irrigate the ground; by which two improvements may be effected at once,—the land being cleared from ant-hills, while its fertility is considerably increased." And the use of night-soil, in combination with various sorts of earthy matters, has been advised with the intention of destroying such insects; but this is probably a practice that can only be depended upon in slight cases. See *Ant-hill*.

Upon stiff yellow clays, a Hertfordshire farmer has found the practice of draining, according to the Essex mode of carrying off the surface-water, useful, though this practice is totally unused by his neighbours in the same parish. Experience has convinced him, that dressing a cold tenacious clay not previously drained is an absurd waste of time, money, labour, and every thing most valuable. Having obtained a tolerably dry surface, his next object (with meadow-land) is to deepen the staple of the soil, and this he does by every kind of compost carried on it for two or three years together, which he finds establishes a better sort of grass than dressing once in three years on the surface.

It is suggested that the custom of feeding the first year, instead of mowing, is a practice that must be preferable or not according to the nature of the soil, and the object of converting it into grass-land. With respect to the former, he has found, that if he was to allow even the treading of sheep the first year after the grass-feed is sown, he should fill the surface with receptacles for water, and should have very little, if any, grass of a coarse quality, notwithstanding his drains; because the sheep or cattle would press the clay soil so close, that the water could not penetrate into them; whereas, if he shuts up his field, suffering the grass to stand till it sheds the seeds, he finds the following season that he is enabled, by giving only a slight dressing, to cut a good crop of hay from it. And in cases of old worn out thin patches or mossy grass-lands, the practice of scarifying or cutting the surface sward, in different directions, by implements for the purpose, has been lately advised as very beneficial in promoting their improvement, especially where they are afterwards manured, and have suitable grass-seeds sown over the thin or patchy parts, as in this way the grass-plants become more strong and vigorous. In performing this business, Mr. Amos has advised the use of a machine for scarifying and dressing grass-land, whether it is to be mown or depastured with animals. And he conceives that the best time of performing this operation, is from the middle of February to the middle of April. And that, in general, dressing the land one way is sufficient; but, if the sward be very mossy or adhesive, it should, he thinks, be dressed length and cross ways, cleaned, and then rolled, the scuffers of the implement being occasionally cleaned from the rubbish. It is also suggested, that if the sward be thin, it may be thickened very much by laying eight or ten tons of rotten dung upon it, and sowing seven pounds of white clover, four pounds of wild or cow-clover, four pounds of trefoil, four pounds of rib-grass, and one peck of bell-rye-grass seeds, per acre, previous to its being dressed or sub-harrowed, and then cleaned and rolled. It is supposed that by dressing land in this way, moss is torn up, ant and mole-hills levelled and destroyed, the roots of the grass cut and horse-hoed, which causes them to throw out fresh lateral shoots or stems, the sward thickened, and the surface made so clean as to put on the appearance of a perpetual spring when close fed down. And that, by such management, and grazing as much stock as will keep the grass in a young succulent state, and hobbing or mowing all the tufts and weeds three times in the course of the summer, the grazier will be enabled to receive every benefit from his land, and likewise

prevent the stems of several grasses from running into feed, and being injured in consequence of it.

But another method of improving grass-lands, practised by Mr. Salter of Norfolk, is said to be original, and of great importance. It is stated in the Norfolk Survey lately published, that "upon his large farm of above 800 acres, he found 3 or 400 acres of old meadows entirely poisoned by springs, which, from every sort of impediment that neglect could cause, had formed bogs and moory bottoms, famous for rotting sheep and miring cows; with blackthorns and other rubbish spread over large tracts. His first operations were, to grub and clear the land, and open all ditches to the depth of four or five feet, and to cut open drains in almost every direction for laying them dry; burning the earth, and spreading the ashes on the ground: so far, the reporter says, all was no more than common good husbandry; but he applied a thought entirely his own: as he found that the stony gravel, marl, and other earths, but especially the gravel, was very beneficial to the herbage, he thought of sowing winter tares and white clover upon the places wherever any earth was spread, or any other operation had laid bare the surface, harrowing in those seeds. The writer had the pleasure of seeing several of these crops growing: the success has been uncommonly great; for the land thus sown not only has given large and very profitable crops of hay, but has also received a rapid improvement in the herbage; the cover and shade of the tares, so beneficial to all land, mellowed the surface, and seemed to draw up as well as protect such of the old plants as received improvement from the manure, and exhibited a much superior fleece of grafs to any spots where this singular management had not taken place. So that nothing can be clearer, on viewing this large tract of meadow, than the superiority of the improvement resulting from the growth of the tares: the effect of the manure is much accelerated and rendered greater."

The reporter further hints, that "the idea is certainly applicable to many of the grass-lands of the kingdom, especially such as are improving by the addition of chalk, marl, clay, loam, sand or gravel: 40 loads an acre of any of these bodies will much improve coarse or wet, or moory grass-lands; and then to add tares secures an immediate profit, and makes the manure work much sooner and more powerfully. He sows some so late as the middle of May." An idea here strikes the writer, which he shall venture to add; that "if he was to scarify any mossy, hide-bound, or poor pastures, &c it should be with a drill-scarifier, drilling in winter tares by every tooth of the scarifier; and he has no doubt but the tares would take well, and effect a considerable improvement, even without manuring." It is stated in addition, that "Mr. Salter has practised the tare husbandry on meadows for ten years, but his first beginning was seventeen years ago, at Ellingham: the cockchafer-grubs had destroyed a part of a meadow; he harrowed in tares and seeds, and the success was great." It is also stated, that "tare-seed running short, he this year sowed peas and oats mixed on some spots, and they are found to do well; and this husbandry he pursues, whether he intends mowing or pasturing. The writer considers this a discovery of vast advantage to grass husbandry in general.

And it is likewise observed, that "Mr. Bevan's arable land, at Riddiethworth, joining to his low boggy meadows, gave him the power of carting sand down hill at an easy expence; and thus he improved some parts of those meadows to great effect: from 100 to 150 loads an acre were spread at the expence of 4*l.* or 5*l.*

## Statement of Expence.

	£.	s.	d.
A team of five horses, 30 loads a day, and wear and tear	0	12	6
Driver	0	1	6
Filling, at 2 <i>d.</i>	0	5	0
	0	19	0

In 1802 this method answered very greatly: these meads were then not capable of irrigation, but one meadow has since been watered, and the water has taken much greater effect on account of the sanding, than if that operation had not been performed. The sand has all been laid on the moist boggy meadows." This hint should not escape the notice of the practical farmer in other districts, as there are many where it may be had recourse to, with the greatest advantage and success. There is likewise a similar method of improving old rough and boggy meadow-land described, with a plate, by a writer, under the title of *Agricola Norfolkensis*, in the first volume of the second series of the *Agricultural Magazine*, as practised by Mr. Rix, of the same county. "This meadow was situated at Clifton, near Fakenham, in the occupation of the above, and the property of T. W. Coke, esq." of Holkham. It is noticed that "this meadow, from the neglect of former tenants, and want of judgment in cutting what few open drains or ditches were attempted, had become very rotten in many places, and at least three parts of the four so over-run with fedge and rushes, that its utmost annual value could scarcely be estimated at more than eight shillings per acre. The lands contiguous to it are of a light friable nature, inclining to sand, by spots, and fall with a gentle declivity towards it from each side, the meadow being the basin and receiver of the numerous springs which rise in the upper fields, and which, in course of time, had rendered some parts of it utterly impassable for an horse, and scarcely safe for a man at certain seasons. It is observed that the first step the present occupier took was, as soon after Michaelmas as he could, to cut the drains, as he has shewn in the plan; all of which are covered, except the main drain, and the two ditches. These latter are cut both wide and deep, and are the chief operating checks to the springs above. And as soon as the weather permitted, he next set the teams to work (which were enabled to enter, even upon the most unbound parts, very shortly after the first process was concluded), to level the hills, fill up the hollows, and to cart all the superfluous mould he could collect within the boundary of the meadow, (such as came out of the new-cut ditches and main drain principally), to the amount of 1000 loads, over the surface of the whole. About the last week of March he drill-rolled; and where the roller could not work, from little inequalities of ground, he dibbled the seeds mentioned in the annexed statement, harrowing the small seeds in afterwards; and, in July last, he cut and stacked the produce, which the writer has seen, and can witness to be excellent hay.

It is added that the present appearance of the meadow, after being fed down very close by more than fifteen score of sheep, exhibits, notwithstanding the very wet season we experienced, one uniformly dry, firm, and smooth surface, completely covered with a short turf, consisting of ray-grass, Dutch-clover, and good natural grasses. There are certainly some rushes yet, but far less numerous and strong than heretofore, and which it may justly be expected a few sweepings with the scythe, and hard flocking with sheep, will in time wholly destroy. But though there may not be

much novelty in the scheme of draining, the writer is of opinion, that very great merit is due to Mr. Salter, for the introduction of vetches, which he apprehends was never before tried on pasture-grounds, or indeed on any ground whatever unbroken by the plough. It certainly answers several admirable purposes, one is, that it gives a prospect every year of a bulky crop of hay, which otherwise must have been very scanty. And being sown with oats, the vetches afford that hovering kind of shade and protection to the young grasses in which they most delight. The oddish is of course also worth more.

But he is not quite sure, whether Mr. Salter's experiment gave rise to the following practice, which he is informed daily gains ground. Where the clover plants fall partially, or by spots, on a new layer, spring vetches are often drill-rolled upon the surface, not ploughed. The few clover-plants are thus left to grow with the vetches, and both together, in due season, form nearly as good a sward, as if the clover had not died away. Mr. Rix is so thoroughly convinced of the utility and advantage of the method he has pursued, that he is now preparing a second meadow, lying at the foot of the one just improved, for a similar process of improvement.

In cases where pasture-land can be spared for mowing, Mr. Salter seems to be of opinion, that vetches may be profitably employed, even a second year, upon new improved meadows. He has had some experience of such a repeated trial, and the writer believes he thinks favourable of it. He dibbles the seed upon the unbroken surface, after feeding it down as close as he can with sheep or other stock.

It is stated that the above meadow of Mr. Rix's cannot be over-rated, if it be said that it is, at this moment, more worth thirty shillings per acre to a tenant, than, in its former state, it was eight shillings the acre.

*Debtor and Creditor Accounts of Mr. Rix's Meadow, ending at Michaelmas.*

1806.

	£.	s.	d.
363 of open drains, at 9 <sup>1</sup> / <sub>d</sub> .	-	-	14 6 3
173 under grains, at 6 <sup>d</sup> .	-	-	9 6 6
500 alder faggots, laid in drains	-	-	5 12 0
Filling and spreading 1000 loads of mould, at 25 <sup>s</sup> . per hundred	-	-	10 0 0

*Seed.*

6 co. sp. tares	-	-	6 6 0
6 bushels of grey peas	-	-	1 2 6
6 do. of oats	-	-	0 16 9
2 do. of ray-grass	-	-	1 10 0
100 pounds of Dutch clover	-	-	3 15 0
Dibbling	-	-	1 8 0

*Horses's Time.*

5 horses 14 days, setting about mould	-	-	7 0 0
4 do. drill-rolling, 3 days	-	-	1 4 0
2 do. bashing and rolling in feeds, 3 days	-	-	0 12 0

*Men's Time.*

1 man driving team, 14 days	-	-	1 8 0
2 men drill-rolling, 3 days	-	-	0 12 0
1 man bashing, 2 days	-	-	0 4 0
do. gathering stones, 2 days	-	-	0 4 0

Total expence 65 7 0

*Produce.*

18 loads of hay, at 4 <sup>l</sup> .	-	-	72 0 0
Feed	-	-	13 0 0
			<u>£ 85 0 0</u>

It is also necessary that care be taken to keep grass-lands in a proper state of production, by the judicious use of top-dressing, and by observing suitable methods of mowing and feeding them down by stock, and it becomes of course requisite in the view of keeping such lands in the most proper condition for the production of plentiful crops, as well as that of altering and improving the nature of the herbage; to have recourse to the occasional application of manure; as by this means the staple and depth of the vegetable mould are not only much increased, but the land brought into such a state of fertility, as that it may afterwards be kept up with much less expence and trouble than before.

A late writer has stated, that "it is a circumstance well known to grass-farmers in the best cultivated districts, that when lands of this sort are suffered to get much out of condition, it is a much more difficult business to restore them to the proper state of productiveness, than to preserve them in it. From the constant decomposition and decay of various vegetable materials on the surface of grass-lands, new portions of vegetable mould are constantly added, that improve the quality of the lands, and at the same time afford a more suitable and fertile bed for the establishment of the different kinds of grass-plants. It is chiefly, perhaps, on these accounts that old grass-lands are superior to new ones, and it explains the reason of the greater utility of earthy composts with dung in the latter than the former cases. However, with respect to the most proper periods of making such applications, there is much difference of opinion; but it should, probably, be regulated by circumstances; such as the state of the land in regard to dryness, its situation, the heat of the season, and its nature and condition in respect to soil and fertility. Where the land is such as not to admit the dung-cart in the early spring-months, without the danger of injuring the surface by poaching or breaking the texture of the sward, the most proper period would seem to be in the beginning of the autumn, before the heavy rains fall, as at this period the dressing may be laid on with the greatest convenience and safety; and from the after-grass being chiefly consumed with the lead loss in that particular. It is, however, recommended to be performed by some immediately after the land has been mown and cleared from the hay, in which method there may be an advantage in some cases, as the growth of the after-grass may thereby be rendered more abundant." But, in other respects, it has been observed by the author of *Practical Agriculture*, that, "it must often be not only inconvenient, but uneconomical, as, from its happening at a season when much other business is to be performed, it can seldom be attended to in such a manner as is necessary; and when the season at this period is hot, and there is much sun, as in general is the case, there must be considerable loss sustained in the extrication and dissipation of the fine and more enriching particles, such as become more immediately the food of plants, from their being in a condition nearly suitable for being absorbed and taken up by the roots of the grasses. The extent of the loss incurred in this way is much more considerable than is commonly supposed, as must appear evident from the great exhalation and constant evaporation that is often kept up for many days, or even weeks,

weeks, as the very offensive smell that issues fully proves. In this district, where we have occasionally witnessed the practice, with some of the less intelligent farmers, the moisture of the manure has been so much forced off and dissipated, especially when there is much wind, as to leave the materials in nearly a perfectly dry state. The sudden drying up of large ponds, at such seasons, shews in a more striking manner the extent of the injury that the farmer sustains in choosing this season for the application of his manure upon his grass-lands. And, it still further states, that "there is another way in which a vast loss of manure may take place when applied at either of the periods that have been just noticed, especially where the lands lie in sloping directions, as is frequently the case, which is by the heavy rains in the autumnal season carrying down the more fine and rich parts of the manure, in a state of solution, into the ditches and runlets on the sides or other parts of the fields. Of the great waste of manure occasioned in this way any one may convince himself, by attending to the state of the water as it drains off from the higher grounds into these places, after the land has been previously dressed, as it will be found highly coloured, and loaded with the enriching carbonaceous particles of the manure." And "after frosts, when sudden thaws occur, the same thing happens" in a still more extensive degree than in the other cases.

In cases where the natural dryness and open texture of the soil admit of the manure being applied in the early spring months, there will be less danger of waste in the above manner, and at the same time greater advantage obtained in the growth of the produce; as, from the moderate heat and quickness of the vegetation at this period, the grass will soon over-shade and conceal the dung, where laid on in a suitable state of reduction or fineness, without suffering much exhalation to take place; and the enriching material be conveyed to the roots of the grass-plants at the time in which it may be the most useful in promoting their growth. Where the principal object of the farmer is a large produce, and the nature of the soil will admit of the manure's being applied without injury, this is unquestionably the most suitable as well as most beneficial time of putting the dung upon grass-lands. The earlier, however, it can be performed the better. See MANURE.

But it has been stated by some, that manure produces the strongest effects upon the land when applied early in the autumn, or in meadows as soon as possible after they have had the hay taken off from them. And others suppose this still as the most proper season for having the business performed in of any.

In regard to the kinds of manure that are most proper, there is scarcely any sort that will not be beneficial when laid upon grass-lands; in general, however, the more rich animal kinds will be the most suitable for the older sorts of sward-land; and dung, in combination with fresh earthy materials, the more proper on the new lays or grass-lands, as by this means a fine earthy bed will be prepared for the roots of the grass-plants to shoot and spread themselves into, and a better sward formed in consequence of such applications. See *Laying LAND down to Grass*.

It is the practice of the best farmers in the hay-district of Middlesex to use the richest dung they can procure, without mixing it with any sort of earthy material, as they find it answer best in the quantity of produce, which is the principal object. The lands on which this system is pursued, are mostly such as have been long under sward, and where the soils are chiefly of the more tenacious, loamy, or clayey kinds. It cannot, however, be doubted, but that

earthy composts in the proportion of a third or fourth of such materials may, in many cases, according to the nature and circumstances of the land, be had recourse to with great and beneficial effects, both in rendering the land more productive, and in bringing the herbage into a finer state, as well as in bettering the surface for the purpose of mowing. See MANURE.

It may be observed, that whatever the nature of the material may be that is employed in combination with dung, or the sort of manure that is used, it should invariably be brought into a rather fine state. It is the practice, in the districts mentioned above, to turn over the dung that is brought from London in a state of tolerable rottenness once, chopping it well down in the operation, so as to be in a middling state of fineness when put upon the land. It is necessary, however, that it should be in a more rotten and reduced state when applied in the spring, than when the autumn is the time of putting it upon the land.

In respect to the proportion of manure made use of at once, it should be, in some measure, suited to the state of the land, but, in general, such as to afford a good even covering to the surface of the ground. Where the manure is of a very good and enriching quality, the quantity may be from four or five to six or seven loads on the acre, of such as are drawn by three or four horses. But where the manure is of an inferior quality, a much larger proportion may be requisite and proper.

The frequency of dressing grass-lands, in so far as it respects the soil, should constantly be performed at such distances of time, as that the fertility of the lands may not be suffered to decline, but be preserved in an equal or increased state of heart; in which the manner and frequency of cutting, or otherwise consuming the produce, must be considered; as, where crops are more frequently taken off, the land must be prevented from being injured, by the great loss of fertility that must arise in this way, by the dressings being applied at shorter intervals, or in larger quantities at a time; but the first is by much the best method, as injury may often be done by too great a dressing being given at once. But, in general, where such lands are in a tolerable state of cultivation, every third year may be sufficient; while on such as are of inferior value, it may be a better practice to do it every second year, as by this frequent application of manure, the lands may attain a gradual improvement; whereas, in the contrary case, they would be on the decline, and in time become poor and worn out to the great injury of the farmer. It is a too common practice, in districts where grass-husbandry is imperfectly understood, to almost wholly neglect the manuring of sward-lands, in order to employ it on those which are under the plough: but this is obviously bad management; as it is only by the raising of full crops of grass for being converted into hay, and of proper kinds of green food, that a full flock of cattle can be kept, and the largest possible proportions of manure provided for the land. It may be noted there are a few articles made use of as top-dressings to grass-lands, which cannot, it is said, be frequently repeated with either safety or advantage, such as chalk, marle, chopped woollen rags, and some others. It is stated, that "the first of these kinds, especially when of a soft, unctuous nature, so as to readily fall down in the state of solution to the roots of the grass-plants, is found to produce the most beneficial effects, in rendering the lands more fertile and productive, and improving the quality of the herbage. It cannot, however, be often repeated in its simple state with advantage, as it is some time in producing its full effects; but in that of compost, it may be applied with success at shorter intervals. Marle is likewise a substance, especially when it is of the rich, soapy kind,



kind, that may be made use of with much advantage as a top-dressing on grafs-lands; but as its operation is slow, it cannot be repeated at short intervals, except when employed in the state of a compost with dung-woollen rags, which, rendered small by being chopped into pieces, may be laid on land in the state of sward; but as they require a considerable length of time to sink down and become mixed with the soil, so as to be well covered by the grafs, they cannot be repeated at short intervals. After they have been fully incorporated with the land, their beneficial effects are considerable," as have been fully shewn in the trials of different grafs-farmers: and there are various other matters that are occasionally applied as top-dressings on grafs-lands; such as lime in combination with rich vegetable earth or peat, the ashes derived from the combustion of peaty substances, coal-ashes, malt, dust, and foot. Most of these have been made use of with good effects when thinly spread out over the surface swards of lands in the state of grafs. The three last have been found to produce the best effects in being dispersed over the new lays of the artificial grafs kinds. All applications of this sort should be applied in February, being spread over the surface as evenly as possible. "If it can be done before a shower of rain, it will be the better, as it is of advantage to have them carried down to the roots of the grafses as soon as possible after they are laid upon the land." But some advise, in the "management of purchased manures, that experiments should be formed for a year or two, before the practice is extended, to see which, at a given price, will suit the land best. Without this precaution, a farmer may probably expend large sums of money to little purpose. Nor should he trust to the mere appearance of the effect soon after the manuring: for some of them, particularly foot and malt-dust, will shew themselves after the first heavy showers, in a finer green than the rest of the field; but the proof of the effect does not arise from fine greens, but from weight of hay: for it has been found from experience, that the latter is not always an attendant on the former. Contiguous half-acres, or roods, should be marked out, the prices of the manures calculated, and on each piece a separate one spread, all to the amount of 20s. an acre, for instance. At hay-time, the crops should be weighed. It will then be known which manure, at the given price, suits the soil best. This knowledge will prove true experience, and a very different guide from general ideas."

And here is still another circumstance necessary to be attended to in putting manure upon lands of this kind, which is not to suffer too much to be placed out in any of the heaps, but to have them set out as much as possible in moderate sized portions, and "at regular distances from heap to heap; as, where the contrary is the case, it not only takes up more time, and causes much more trouble to the labourer in spreading them, but does not admit of the work being performed in so regular or so exact a manner. Besides, when the heaps are set out too large, much injury is done to the grafs-plants on the surface where they stand, if not soon spread out, which should always be the case, in the quickest manner."

It is also of much consequence, in the execution of this business, to have convenient carts for the purpose, which, in general, are those of the single-horse kind.

Some care is likewise necessary in the sealing or "spreading-out" all sorts of top-dressings on grafs-lands, to see that the work be performed in an exact and even manner, and that all the clods and lumps be well broken down and perfectly reduced by beating with the fork or shovel. If possible, a dry season should be chosen for this sort of business, as, under such circumstances, it can be executed in the most regular and exact

manner; as when the weather is wet, it is an operation that can never be well performed, as the material, clog round the feet and implements of the workman, and can never be actually separated or divided so as to be spread out with the necessary degree of evenness. It has been already noticed, that "after the heaps have been set out, they should not be suffered to remain so long, as is often the case, before they are spread out, as the plants underneath them become blanch'd and tender, and great injury is done to the sward in such cases, all of which may be easily avoided by spreading as soon as possible after the manure is taken out. The inconveniences of this kind may likewise be avoided by spreading the manure from the carts, as is the practice in the midland and some other districts; but in this method it is supposed the work can neither be executed in so exact a manner, or with so much economy of time or labour. In this way lumps of dirt will not be formed, and, of course, the disadvantage of their getting too large a proportion of the manure prevented," as Mr. Marshall has well observed in his *Economy of the Midland Counties of the Kingdom*.

The usual practice, as soon as "the whole has been spread out, and remained in that state for a fortnight or three weeks, or longer, according to circumstances, and is become in some degree dry and powdery, to apply a bull-harrow over the surface once or twice in a plow, in order to reduce the manure into a finer state, and bring it more fully to the roots of the grafses. But this sort of work, as that of spreading, should never be attempted when the season is wet, and the manure in a claggy, adhesive state. As soon as this work has been executed, all the rubbish of every kind should be carefully picked off, in order that the ground may receive the action of the roller," which should be passed over it as frequently as may be thought necessary, when the land is in a suitable condition for receiving it. (See *Rolling*.) This is the principal business which is requisite in the management of grafs-lands in general.

In Hertfordshire, "a mode of managing found meadows and pastures has lately been tried, and attended with great increase of produce. The grafs is mown as soon as it is in blossom, and consequently previous to the formation of seed. The after-grafs is not grazed until it begins to contract a yellow appearance, in the latter end of October or the beginning of November. In this case the ground remains covered during the winter with a portion of dead herbage, through which the young grafs springs with the greatest vigour. Mr. Knight contends, that the sap in all plants ascends through the albuminous vessels of the root, and is dispersed over the leaf, whence it is returned to form new roots and buds, and to prepare them for vegetation. According to this theory, if the leaves be eaten off on mowing ground, as soon as they are reproduced, the roots are deprived of their nutriment, and the plants in consequence vegetate weakly in the succeeding spring. Whether this hypothesis be well or ill founded, it is certain that the ground which is left with this portion of the leaves of grafs in the one season, is much more productive, and more early in the next; and close grazing will ever be found to decrease the quantity, although it should improve the quality, of the following crop." It is evident that there is some truth in this, from the following being found that the crops are more early and abundant in the former case, where the after-grafs is not fed down much by the continual feeding with live flock. See *Mowing and Grazing*.

#### *Comparative Quantity of Food for Grafs and Live Stock*

With respect to the difference in the composition of human food raised from grafs and other plants, the circumstances necessary to be attended to, in order to avoid the inconveni-

commonly denominated *Price*. But these inquiries suggest a further idea concerning the part of the produce, of either grafs or arable land, to which that circumstance is attached. It is evident, on the slightest view of the subject, that the portion of the produce consumed in the farmer's family can have little to do with the price of the market: it never finds its way thither: it never comes to be measured with the demand of the consumer, who does not produce. For this reason, in all inquiries that have for their object what is called plenty or scarcity, we never hear of any thing but price; and price is never formed but by the supply of towns from the produce of the country. The larger part of a modern society consists of the inhabitants of those towns, who are supported either by manufactures, or on incomes not derived immediately from the cultivation of the earth. So much for just opening our way in a field rather interesting: but may we not, with equal propriety, extend the circumstance just alluded to, to the labouring families supported by the farmer? His little neighbours in the village who do the work of his husbandry, arrest, if we may so express it, the amount of their subsistence from the crop before it arrives at the market. They must be fed; and though in many cases, by buying their flour of a miller, they seem to class with the inhabitants of a town, yet, perhaps, in more numerous cases they are, in fact, fed immediately from the farmer's stores; and in effect always so: for, if the farmer cannot produce his crops but by their direct assistance, and must multiply them exactly in proportion to the opulence of his culture, they cannot be considered in any other light, than mouths attached to the culture of the land, and demanding a deduction from the produce of wheat, before the surplus or market be reckoned, in as direct a deduction as that from his crop of oats for the food of his horses, or other animals. It is added that there are in the Suffolk Report some estimates of what the writer calls produce free in the market, and he makes the grafs-lands yield a greater free produce (horses, labour, &c. &c. deducted) than arable; and he knows not but it may be the same in other counties. Other writers seem also to have had the notion that grafs-land is more beneficial than arable. Bertrand, a Swiss writer, says, that grafs-countries yield more food than arable, and therefore manufactures should be fixed in them. Hartlib seems to be of the same opinion, and quotes those of Europe as the most populous. Fortrey, who wrote in 1663, also says, that our chief care should be to increase our flock of cattle. There is some degree of truth in these sentiments; and they might be considered in relation to the proportionate nourishment, in a pound of animal food compared with that of a pound of vegetable, which some authors have made vastly greater in meat than in bread. These are topics, it is stated, which ought to be thoroughly examined, that the public mind may be free from every erroneous bias upon such points. But further in the dairy countries, where butter is the chief produce, four shilings, or 224 lbs. may be reckoned the average produce per cow; the calf sold at about a week old, may contain about 30 lbs. of flesh; and as the pigs supported by a dairy, used to be reckoned at the rate of 20s. per cow, when pork was 6d. per pound, it implies, that 47 lbs. of pork is the proportion to each cow: but the cow consuming the produce of three acres, the acreable account would of course stand as below:

<i>Acreable Account.</i>		<i>lbs.</i>
In Butter	- - -	74
Veal	- - -	10
Pork	- - -	13
		—
Total		97
		—

However, in the cheese counties, the products vary a good deal: in Cheshire 4 cwt. per cow; in Shropshire 2½ cwt.; in Gloucestershire about 2¼ cwt.; in Wiltshire 4 cwt.; in Somersetshire 3½ cwt.; in Warwickshire 3 cwt.: the average of all these is 3½ cwt. and at three acres per cow, 1 cwt. and a small fraction per acre; and as these counties are richer than those applied to the produce of butter, veal may be called 15lbs. and pork 20lbs.; in all 147lbs. per acre, or thereabouts. But as to mear, authorities are not very ample: in the midland counties there is a very general notion, that an acre of grafs, at 4s. rent, will give 200lbs. of mutton. By an experiment made on land of an inferior quality, which is mentioned in the Annals of Agriculture, land of 16s. rent, gave 80lbs.; and he has heard, on good authority, that in Cambridgeshire some observations, carefully made, confirmed this proportion of produce in land fed both with bullocks and sheep; and the produce of beef, &c. in the Lincolnshire marshes, goes even further than this ratio or proportion to the acre.

With respect to the butter dairies, they are on land of about 16s. an acre rent; and if the produce be 97lbs. the proportion will be 6lbs. to every shilling rent. The cheese dairies, at 25s. rent, yielding 147lbs. are also at about 6lbs. per shilling rent. The meat is 5lbs. per shilling. It is easy then to decide, that dairy counties are more advantageous than grazing ones in weight of produce; but their superiority is far greater in another point of view; their produce comes much more into the consumption of the poor; for, where one poor person eats meat, there are probably forty that consume butter and cheese. How to compare these products with those of arable land is very difficult; and yet the inquiry is too interesting entirely to be omitted: a long train of investigation might enable one to disentangle difficulties, but it would require much time to go deeply into such a variety of subjects. The produce of a good loamy soil, under the course, 1. Turnips, 2. Barley, 3. Clover, 4. Wheat, may, it is supposed, be calculated in this manner.

“No. I. *Arable dry Land at 16s. an Acre Rent, five Acres each Crop; twenty Acres in all, in a Course of four Years' Husbandry.*

- |        |   |        |        |    |     |
|--------|---|--------|--------|----|-----|
|        | <i>Time.</i>  |        |        |    |     |
|        | <table border="0" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Years.</td> <td style="text-align: center;">Weeks.</td> </tr> <tr> <td style="text-align: center;">2.</td> <td style="text-align: center;">3 5</td> </tr> </table> | Years. | Weeks. | 2. | 3 5 |
| Years. | Weeks.  |        |        |    |     |
| 2.     | 3 5   |        |        |    |     |
1. Turnips; eight sheep an acre, at the increase of 5s. each sheep, or 40s.; in mutton 80lbs.; and for 5 acres 400lbs. will be sufficient (at 1lb. per person per diem) for two persons, one year and five weeks.
  2. Barley and oats; suppose an allowance of 1½ acre of oats (at five quarters per acre) for one horse as the proportionate team to twenty acres, and including feeds for 1½ acre: in all sixty bushels; remain 3½ acres for barley, at four quarters an acre; fourteen quarters or 112 bushels; deduct fourteen for seed, remain ninety-eight bushels for malt, &c.; but, if applied in bread, sufficient at nine bushels per head per annum, for eleven persons a year, minus one bushel.
  3. Clover; deduct two acres for the summer and winter food of the horses, remain three acres for sheep, at eight per acre, improved 8s. each, or 36. 4s.; or (at 6d. per pound) 18lbs. of mutton, and for three acres 54lbs. suffi-

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	Persons.	Years.	Weeks.
cient at $\frac{1}{2}$ a lb. a day for two persons a year: and leaving 20lbs. over; -	2	1	20
4. Wheat; twenty-two bushels per acre, which, after deducting feed, leave twenty, or $2\frac{1}{2}$ quarters, and for five acres $12\frac{1}{2}$ quarters, sufficient for twelve persons a year and two weeks	12	1	2
<i>Whole produce in human food</i> -	16	1	17

The same land, if in grass, would give 80lbs. of mutton per acre, 400lbs. per ann. and for four years 1600lbs. sufficient at  $\frac{1}{2}$  lb. a day to support eight persons one year and thirty-six days' - - - - -

8	1	36
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Hence, "to make the deduction, before alluded to, of the farmer's family, and his labourers: suppose he farms an hundred acres, which is, probably, above the average size of farms of the kingdom, here are five persons to that extent, or one to twenty acres. If we reckon all sorts of labour at 21s. an acre, we shall, he supposes, not be far from the fact: the pay of a labourer may be reckoned on an average at 25l. which we shall call the food of five persons; setting the earnings of the wife and children against rent, clothes, and other articles; this makes food 5l. a head: for every 5l. therefore that the farmer pays in labour, we may safely, he supposes, reckon that one person is fed from the produce of his farm before it reaches the market: the labour in the twenty acres in the above inserted estimate being 21l. he calls four persons', and the farmer's family one, making five, to be deducted from the acreable amount of the farm."

	Persons.	Years.	Days.
Brought forward - - - - -	16	1	17
Deduct - - - - -	5	0	0
Remains for market - - - - -	11	1	17
And the 20s. excess in the 21l. strikes off - - - - -	0	0	17
	11	1	0

Yet, "in regard to grass land, as it is managed with so much more ease, and farms are generally so much larger, it will be fair to deduct only one person for farmer and labour."

	Persons.	Years.	Days.
Brought forward - - - - -	8	1	36
Deduct - - - - -	1	1	36
Remain for market - - - - -	7	1	36

"It then appears, that under the circumstances of such land thus applied, arable land, on comparison with grass, feeds to market in the proportion of 11 to  $7\frac{1}{7}$ . But if the barley, instead of being drunk, be eaten in bread, it adds to the arable account eleven persons, and the account would then stand nearly twenty-two to  $7\frac{1}{7}$ , or about three to one.

"But, as the largest part of the kingdom is employed in systems of husbandry very inferior to this excellent one, let us calculate how the comparison will stand with open fields,

and those inclosures which are managed by means of fallows in the ordinary rotation of cropping that is pursued upon them.

"No. II. *Open-field arable—Soil clay or wet—Rent 10s. an Acre, five Acres each Crop; thirty in all, in a Course of Six Years' Husbandry.*

	Persons.	Years.	Weeks.
1. Fallow:			
2. Wheat; produce twenty-two bushels; feed two; for consumption twenty, or $2\frac{1}{2}$ quarters; $12\frac{1}{2}$ quarters for five acres, being food for twelve persons during one year and two weeks -	12	1	2
3. Oats: produce four quarters an acre; feed half a quarter; remain $3\frac{1}{2}$ quarters per acre, or $17\frac{1}{2}$ quarters, or 140 bushels: sufficient, at twenty-five bushels a head, to feed five persons a year and five weeks, if used in bread.			
4. Fallow:			
5. Barley; supposed to be consumed in beer, &c.: but, if eaten by man, at four quarters an acre, deducting half a quarter for feed, remain $3\frac{1}{2}$ quarters or twenty-eight bushels; and at nine bushels a head, sufficient for three persons one year, and one bushel over, and five acres, enough for fifteen persons one year and two weeks.			
6. Beans; for horses equal to the food of $1\frac{1}{2}$ horse (at one horse to twenty acres) for the year.			
	12	1	2

But the same land laid down to grass, and let at 20s. will, he says, feed (on the supposition of an increase 5lbs. per shilling rent) oxen and sheep to the addition in weight of 100lbs. of beef and mutton, or 500lbs. for five acres, and 3000lbs. in six years; which, at half a pound a person per diem, or 182lbs. per head per annum, will feed 16 persons one year. The course here detailed does not feed the horses in summer; but as it affords, perhaps, more horse-food in the beans than to that amount, no other deduction should be made. It appears, that thirty acres of such land, when the oats and barley are eaten by horses, or drunk by men, support twelve persons a year and two weeks; now from this we are to deduct, as in the former case, the population of the farmer and his labourers; the former in the same ratio as before; but 15s. will be enough to deduct per acre in labour, instead of 21s. in the other course. This will, on thirty acres, be 22l. 10s. or 41 persons a year: add one and a half for the farmer, it is six in all.

	Persons.	Years.	Weeks.
Brought forward - - - - -	12	1	2
Deduct labour and farmer - - - - -	6	1	0
Remain for market - - - - -	6	1	2
The grass - - - - -	16 $\frac{1}{2}$	0	0
Deduct $1\frac{1}{2}$ for farmer and labour, that is, one per 20 acres -	1 $\frac{1}{2}$	0	0
Remain for market - - - - -	15	0	0

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But if the barley and oats be brought into the account as human food, the account will then stand in this way.

	Persons.	Years.	Weeks.
Wheat - - - - -	12	1	2
Oats - - - - -	5	1	5
Barley - - - - -	15	1	2
<hr/>			
Deduct for farmer and labour - - - - -	32	1	2
	6	1	0
<hr/>			
Remain - - - - -	26	1	2

It is consequently stated, that in one case, the grafs has the advantage as fifteen to six; in the other, the arable as twenty-six to fifteen.

“ No. III. *Poor Sand or Heath*.—Rent 5s; five Acres each Crop; thirty Acres in all.

1. Turnips: four sheep an acre, to the increase of 6s. each, or 24s.; in mutton 48lbs.; and for five acres 240lbs.: sufficient, at  $\frac{1}{2}$ lb. per diem, for one person one year sixteen weeks and four days - - - - - 1 1 16 4
  2. Barley and oats; one horse to thirty acres, which demands  $2\frac{1}{2}$  acres of oats, at three quarters (feed deducted); the remainder therefore  $2\frac{1}{2}$  acres for barley, at  $2\frac{1}{2}$  quarters per acre, being sixteen bushels (feed deducted), and for  $2\frac{1}{2}$  acres forty bushels remain for malt; but enough in bread, at nine bushels a head for  $4\frac{1}{2}$  persons a year, minus one bushel.
  3. Grasses.
  4. Ditto.
  5. Ditto.
- The whole, without any horse account, would feed,  
 1st year, three sheep per acre, 26 weeks  
 2d two ditto ditto  
 3d one ditto ditto to the improvement (or the value in keeping) of 40s., and for five acres in each to 10s.; hence it appears that to keep one horse would almost equal the whole amount.
6. Rye:  $1\frac{1}{2}$  quarter; twelve bushels; feed deducted, ten; sufficient to support one person fifteen months; and for five acres six persons one year and eight weeks - - - - - 6 1 8 0

Within a small fraction equal to The same land in heath would feed, but not fatten, to the value of 10s. per acre; call this 20lbs. of mutton; 100lbs. for five acres, and 600lbs. in

fix years; sufficient, at  $\frac{1}{2}$ lb. per diem, for three persons a year and thirty-six days - - - - - 3 1 5 1

	Persons.	Years.	Weeks.	Days.
Brought forward, arable account - - - - -	8	1	0	0
Deduct, as farms on this soil are large, only half a person for thirty acres for the farmer; and reckoning labour at 8s. an acre, it is 12s. for thirty acres, or $2\frac{1}{2}$ persons; in all three - - - - -	3	1	0	0
<hr/>				
Remain for market - - - - -	5	1	0	0
<hr/>				
Grass for ditto - - - - -	3	1	5	5

But “ a fraction is to be deducted for farmer and shepherd. The difference, therefore, is as five to three. But if the barley be consumed in bread, the account will be,

	Persons.	Years.	Weeks.
Brought down - - - - -	5	1	0
Barley - - - - -	$4\frac{1}{2}$	1	0
<hr/>			
Together	$9\frac{1}{2}$	1	0
<hr/>			
Grass - - - - -	3	1	5

Consequently the arable is therefore superior as nearly three to one. Upon the whole of these comparisons it is sufficiently clear, that the arable land is, and in every case may be, (by eating barley and oats,) far superior to grass-land in the article of feeding not only the people at large, but also in sending a surplus to market. He cannot, however, let his papers go from his hands without requesting them to be read with candour. He presumes to offer them but as rough sketches, that may approximate to truth, but cannot reach exactness; they may afford hints useful to future inquirers, and the subject is interesting enough to answer well a very careful examination. One observation that goes generally to all is too material to be omitted; the production of meat in England is, it is supposed, of small importance compared with that of corn, because the poor do not live on the former; meat is the consumption, generally speaking, of those who are in very easy circumstances, compared with the great consumers of corn; nor would the times be much complained of, whatever the price of meat might be, provided corn were at a reasonable price. This is a circumstance which should be considered as decisive of the inquiry; and sufficient to prove, that the great interests of the public demand every possible encouragement to tillage so given, as shall preserve corn at a fair price, neither too high for the poor, nor so low as to discourage the cultivation of it by the farmer.

With regard to what ought to be the proportion between the grass and arable land of a farm, errors are, it is observed, extremely common among landlords, and not less so with farmers: in general, however, they both look to their own interest; the first to keep much in grass, and the latter to plough all they can: with short leases, and bad covenants, we are not to be surprized at either. One acre of moderate corn, says Adam Smith, in his Wealth of Nations, yields a greater neat profit than an acre of the best pasture. And experience, Mr. Davis of Longleat observes, sufficiently evinces the extreme difficulty of persuading tenants to believe that they get more, generally speaking, by feeding their lands than by ploughing them; yet it requires very

very few arguments to convince a landlord, that in cold wet lands especially, the less ploughed land you have, the less you put it in a tenant's power to ruin your estate. That a tenant of 6*ol.* per annum in a dairy-farm will get money, while a corn-farm will starve its occupier (though, perhaps, the former gives 15*s.* an acre for his land, and the other but 10*s.*), is self-evident. Perhaps, says Mr. Billingfley, in the third volume of the Bath Memoirs, there cannot be a stronger proof of the inferiority of the plough, with respect to profit, than the superior punctuality of the dairy-farmer in the payment of his rent. He never met with the steward of a manor devoted partly to corn and partly to dairy-farms, who controverted this statement.

*Clay.*—Upon “this soil, when tenacious and not easily drained, a larger portion should, it is observed, be kept in grass than perhaps on any other; and for this reason,—green winter food is not to be gained at all, or, if gained, not without great difficulty and expence; consequently, the team, and whatever cattle may be kept for consuming straw and making dung, must depend in a larger measure on meadow hay, than upon soils which admit turnip, cabbage, &c. Clover will do on clay, but it is more hazardous and liable to failure; in which case, without a certain resource in the hay of natural grass, the farmer would often find great inconveniences. He has examined many farms with this object in view, and found that, when half the land has been grass, they have been more profitably conducted than with a less proportion; but on no account with less than one-third.”

*Loam.*—It is stated that “one-third or one-fourth in grass is a proportion found suitable to various loams; the more they tend to wetness, the larger the portion. It is not, however, essential on these soils, not only because clover and other artificial grasses are less apt to fail; but likewise by reason of their admitting profitably the alternate husbandry of grass and arable.”

*Sand.*—It is contended “that some rich sands are of so happy a texture, that they do very well in permanent grass, and without burning in slight droughts; but, in general, it may be observed, that sand in its several varieties is, of all other soils, that which pays best in tillage: it is easily worked; expences are light; it manures itself by agreeing well with sheep; and, as the result of the whole, farmers are usually rich upon it. In respect of the proportion, it is best managed, perhaps, when the whole is under the plough; for, by means of cultivated grasses of proper sorts, all the stock of the farm may be profitably supported, and the land rested sufficiently, for ensuring a perpetual production of corn. But, contrary to this maxim, and most unprofitably, large tracts are commonly tied up from the plough, by covenants of leases, under the name of sheep-walk, heath, &c. which would, by alternate tillage and rest, produce more corn, and keep more sheep, than in the present state: this is particularly the case in Norfolk, Suffolk, Nottinghamshire, and some other counties.”

*Chalk and Lime-stone Soils.*—“Nearly the same observation is to be made on this class; they are more productive under the plough than in grass. But landlords tie up their tenants from ploughing down in Sussex, Hampshire, Dorsetshire, and Wilshire; but in Gloucestershire, the East Riding of Yorkshire, and Lincolnshire, they have, on the whole, been less tenacious; still, however, large tracts remain, which would be ploughed were tillage permitted. Rules may be carried too far, and this among the rest. Dorsetshire has its ewe leases, which, in many cases, ought not to be touched; and fine sweet downs, which by very attentive management have been brought to a considerable degree of fertility, are

so useful to sheep in winter, that exceptions must occur. Another motive for ploughing is the peculiar advantage derived on this soil from fantom, one of the most useful grasses that we owe to the bounty of Providence, but attainable only by tillage.”

*Peat.*—Immense regions of moors spread widely through all the northern counties, and even in the most southern, as Devonshire and Somersetshire, Cambridgehire and Wiltshire; also sedgey bottoms are found every where. They admit and call for a much greater improvement than any other soil, comprehending the larger part of the waste lands of the kingdom. These soils are very rarely brought into the state they are capable of, without tillage, and consequently, to prohibit it, is to pass a decree of perpetual sterility. The obstacle, however, most common on moors is, the rights of commonage, which do not come within the scope of the present inquiry. When improved, they are commonly much more adapted to grass than to tillage; not however without numerous exceptions, as we see by the general practice in the fens of Cambridgehire and Lincolnshire. The alternate husbandry does well upon them; it is easy, however, to be too busy with the plough; for, when good grass is gained, it is the wiser way to continue it in a productive state.

But it is further stated, that the subject of the proportion between grass and arable requires a word or two, viewed in another light, besides the relation to soil. This is the prevalent application of the land. In the northern counties, where grazing very widely extends, it is common to see entire farms of grass-land, and the tenant prohibited from breaking up an acre; in such cases there is a motive for ploughing not immediately connected with soil. To till a part would be right, whatever the soil may be; it may draw, in such a country, is not to be bought, and the convenience and profit of having some is no inconsiderable object; it would be carefully used as litter, and the manure arising would improve a portion of the land. Some cuttages, or Swedish turnip, or common turnip, might be raised (which to a certain extent, and for certain objects on such farms, would be highly valuable to the grazier), so as to outweigh large expences in procuring them on soils not quite adapted to their culture. There is not a question but a farmer in such cases could afford to pay more rent for the liberty to plough a portion of his land than under the present covenants. This would, it is supposed, extend to a fourth of the farms in soil rather unfavourable to the plough; and to a large proportion in others. But even three or four in old fields, though no more than one-sixth, one-eighth, or one-tenth, would be highly advantageous to himself and the public, and not at all injurious to the landlord or owner. And to dairy-farms, which entirely in grass, as many are in Wilshire, Gloucestershire, and other counties, this remark is yet more applicable, as the produce of tillage, straw, cabbage, &c. is yet more necessary than in a mere fattening farm. In this case, and indeed in soil otherwise, the quantity might be partly regulated by the team; a dairy-farmer, who keeps four horses to draw his butter or cheese wheels, &c. ought, without question, to have tillage enough to employ these horses; and it is to difficult matter to ascertain that quantity. If the various works be examined carefully, it will be found, that a horse to twenty acres of tillage is a fair proportion, which will leave time for carting hay in summer, and the products of the farm in winter. He is not speaking here of tillage farms on roads, &c. or with rotations of crops, in which the soil rests for several years: on such the proportion varies: but merely on grass-farms, where some herds must be kept, and are at present un-

unemployed a large part of the year. But meadow farms, properly so called, are never, to his knowledge, met with but in the vicinity of great cities, where the demand for hay is great and uniform; horses on such are kept only for the purpose of carrying hay to market, bringing dung back, carting the hay to the rack, and the manure to the fields. Straw is wanting for litter and for thatch; but it is questionable whether it is profitable to plough for this object only in any case; a scattering of tillage is in some places found, but not by any certain rule; the necessity is small, and straw usually to be purchased. Such districts, being highly improved, demand very little attention, it is supposed. See *Tillage, Rotation of Crops, and Pasture*.

*Grass-Leaf*, in *Agriculture*, a term frequently applied to such sward lands as are appropriated to the purposes of grazing, or the fattening of neat cattle and sheep.

*Grass-Seeds*, a term often used to signify the several different seeds of grasses that are employed in laying land down to the state of turf. It was, however, formerly, mostly made use of to denote the mixture of all sorts of rubbish that was scraped up from the hay lofts, or collected in the cribs or boxes below the racks in the stables. But, in the improved method of forming new grass lands, the practice of using such mixtures of seeds is almost wholly laid aside, and only such as are really useful and proper, had recourse to, by which the lands are found to be much more valuable and productive. See *Laying Lands down to Grass*.

*Grass-fods*, in *Rural Economy*, a name applied to such fods or turfs as are pared off from the surface of old sward-lands, whether they be intended for the purpose of burning on the land, for fuel, or for being laid down in order to form a lawn, or small plot of fine even turf. In the former intentions they are generally pared off by ploughs, or spades, contrived for the purpose; but in the latter almost constantly with great regularity and exactness, by a turf spade for the purpose. A tool of the plough kind seems, however, capable of being employed in this way also with advantage. See the next article.

*Grass-fod-cutting Plough*, the name of a tool of the plough kind, which was invented on the continent by count Van Mattzen, and which has been highly useful in cutting grass-fods in a cheap and expeditious manner. It can also be had recourse to with great advantage in paring the swards off old grass lands, wastes, and commons, previously to their being burnt and brought into the state of tillage-husbandry. It is likewise capable of being converted to the purpose of forming walks in grounds where they may be wanted, as well as in paring the bottoms and sides of them, and of such as have been already made, by which means the gardener will only have the simple business of raking and rolling them to perform.

By some slight alterations in the manner of placing the coulters, grass fods are likewise capable of being cut in a very ready manner, and in any form that may be required, so as to be employed in the construction of banks, fortifications, huts, and other works of a similar kind. It would seem, consequently, to be a very useful tool in the expensive business of constructing embankments against the sea, or other large waters.

The inventor was led to the construction of this plough, in consequence of the want of a more cheap and expeditious method of performing the work than the usual one of the spade, in cutting turfs for forming grass-plats, &c.

It may be observed that in forming the tool, the beam, or fore part of any common plough will answer the purpose; this part is consequently not represented in the figure, the kind or operative parts being simply shewn. The tool is

capable of being managed by any person who is able to direct a common plough.

This plough may be seen at *fig. 7.* in the *Plate on Grazing*, in which the nine holes shewn by A, A, is the beam, serve, as in the common plough, to regulate the length of the beam merely by placing the pin C forwards or backwards, and thereby to make the cutting-iron to work to greater or less depth. The two coulters, E, E, which are placed on each side of it, in front of the cutting-iron D, serve to guide the side cut, preparatory to the separation of the turf or sod. The cutting-iron D may, by means of the screws G, G, be raised or lowered at discretion. And, in order to keep it in its place properly, the two supports at H, are made, and provided with several holes for the purpose at I, formed in the cutting-iron D. The two handles are displayed at K, K, and the frame at L L L L; the whole of the remainder, which in the frame is marked black, is to be formed of iron.

A certain degree of practical experience is necessary, in order to use this plough, so as to form the turfs with exactness; and in the commencement of the work care should be particularly taken that the workman does not cut the turfs too deep, and that the plough be not injured by his inattention. In a very short time, he will, however, be so accustomed to the business as to perform with great exactness. In setting out the work, a breadth equal to the width of the two cutters should be previously cut out, as by that means the cutting-iron takes the sod at a proper depth, and executes the work, as soon as the draught commences, in the team. In the performance of the work, oxen are recommended as preferable to horses, from their drawing more steadily, and being more readily managed on stiff lands; but we apprehend that this will not, in general, be found to hold good, and horse-teams are far more expeditious. See *TEAM*.

*Grass*, in *Mining*, signifies the natural surface of the earth over a mine; sometimes also it is called "the day," or the top; and a mineral vein appearing on the surface, is said to come, or appear to grass, or to the day. Coals and other stratified minerals, when they come to the surface, are said to basset, crop, burst-out, go-out, to want-cover, to run-out, to out-burst, to head-out, to run-out, &c.

*Grass River*, in *Geography*, a river of America, in the N.W. part of the state of New York, which rises near the main branch of Black river, and runs N.N.W. about 50 miles, then N.E. 40 miles, and is lost in the river St. Lawrence. N. lat. 45° 12'. W. long. 74° 48'. It is a rapid river, affords many mill-seats, and near the mouth, its banks produce great quantities of hay.

*GRASSE*, a town of France, and principal place of a district, in the department of the Var. The place contains 12,521, and the canton 13,554 inhabitants, on a territory of 100 kilometres, in four communes. The principal trade of the town consists in dry fruit, olives, oil, perfumes, and tanned leather:—9 miles W.N.W. of Antibes. N. lat. 43° 39'. E. long. 6° 59'.

*GRASSE, La*, a town of France, in the department of the Aude, and chief place of a canton, in the district of Carcassonne; 20 miles S.W. of Narbonne. The place contains 1123, and the canton 4524 inhabitants, on a territory of 292½ kilometres, in 18 communes. N. lat. 43° 5'. E. long. 2° 42'.

*GRASSES, Petrified*. Mr. Whitehurst, in his "Inquiry concerning the Earth," 1st edit. p. 169, mentions grasses among the vegetable remains in the coal-measures of Derbyshire; but the late Mr. William Martin, who was perhaps better acquainted with these strata, says, "Outlines," p. 85, that



that the gramina of these argillaceous strata are of unknown species in the recent state, and appear rather allied to the canes and reeds of the Indies, than to grasses properly so called. Mr. Farcy also, in his laborious researches among these carboniferous strata, has seen nothing resembling grasses imbedded in them. See REEDS.

In peat districts, which are of modern or recent accumulation, and within the range of flooded rivers, it is not uncommon to meet with preserved grasses, probably belonging to many of the recent species, at considerable depths below the surface of, or even at the bottom of the peat, or muddy deposits; but such peat fossils should on all occasions be distinguished carefully from stratified, or real fossil remains, as remarked in our article COAL.

GRASSHOPPER, in *Entomology*, a species of *Gryllus*; which see.

GRASSHOPPER, in *Ornithology*, a name given to the *Alauda trivialis*; which see.

GRASSI, CECILIA, in *Biography*, afterwards Mrs. Bach, who performed the first woman's part for several successive years at the opera with Guarducci and Guadagni, was inanimate on the stage, and far from beautiful in her person; but there was a truth of intonation, with a plaintive sweetness of voice, and innocence of expression, that gave great pleasure to all hearers who did not expect or want to be surprised. Her performance of the part of Euridice, in Gluck's "Orfeo," with Guadagni, was perfect in all respects, and gave universal satisfaction.

GRASSWINKEL, THEODORE, a learned lawyer and writer, who flourished in the 17th century, was a native of Delft. He wrote various works upon legal and political subjects, by which he acquired a considerable reputation, and was regarded by the government as a proper person to fill some office in the state; he was accordingly made fiscal of the domains of the states of Holland, and secretary of the bipartite chamber on the part of the states-general. He died in 1666, at Mechlin, and was buried in the great church at the Hague. His works were numerous: of these the following may be noticed, "Libertas Veneta, seu Venetorum in se et suos imperandi Jus." This was published in 1634, and in 1644 he defended the republic of Venice, in a dispute with the duke of Savoy concerning precedence. For these services, that republic created him a knight of St. Mark. Previously to the publication of the last of the two above-named works, he attempted to confute the popular maxims of Buchanan, in a treatise, entitled "De Jure Majestatis." This was dedicated to Christina, queen of Sweden, who was known to be a great assertor of regal privileges. Grasswinkel defended the liberty of the seas against a native of Genoa, in his work "Maris Liberi Vindicte." He was author, likewise, of a treatise in two volumes 4to. "On the Sovereignty of the States of Holland." He was at all times a defender of particular states; but a violent oppugner of the rights of the people. Moreni. Bayle.

GRATAROLUS, WILLIAM, was born at Bergamo, in Italy, in the year 1510. He was educated at Padua, where he took the degree of doctor of physic, and afterwards became professor of the same science, and gained considerable distinction. But having embraced the Calvinistic doctrines, on the persuasion of Peter Vermilli, he fled from Italy, through fear of the inquisition, and retired to Marburg, where he taught medicine for a year. But he was compelled to leave that place also, and repaired to Bale, in the hope of a better fortune, and where, in fact, he taught and practised his profession with success, until May 1562, when he died, at the age of 52. He was author of a great

number of works, some of which are honorable to his talents, and evince a large share of knowledge; but in others he shows an attachment to the absurdities of the alchemist, much superstition, and opinions which do not imply a sound judgment. Eloy. Dict. Hist.

GRATCHI, in *Geography*, a town of Russia, in the country of the Cossacks; 20 miles N.W. of Tzaritzien.

GRATIAN, in *Biography*, a Roman emperor, son of Valentinian I. was born at Sirmium, in 359. He was appointed by his father to a share in the empire when he was but eight years old. He was in his seventeenth year when Valentinian died. At this time Gratian was keeping his court at Treves, and was ignorant of what had happened till he was informed that the officers of the army had appointed as his partner in the throne Valentinian II. the younger son of the late emperor, by his second wife Justina. Gratian, though hurt at the assumption of authority on the part of the army, readily ratified the election, and ever treated his brother with affection and tenderness. The Western empire was nominally divided between them, but the superior age of Gratian gave him all the power. One of his first acts was to recal his mother to court, who had been divorced and banished; and this act of justice was followed by the punishment of certain officers in the state, who had abused their power, by cruelty and injustice. While the emperor is praised for these deeds, he has not escaped blame, and a high degree of censure, for putting to death the renowned general Theodosius, who fell a victim to the jealousy of some rival courtiers. History has also censured him for the indulgence which he afforded to the clergy, and for his severity against those who were denominated heretics, for the gratification of the orthodox. At the head of the Eastern empire was his uncle Valens, who was in 373 attacked by the Goths. Gratian, active and courageous, put himself at the head of an army, and marched to his assistance. He obtained a decisive victory in Alface, and, pursuing his successes, crossed the Rhine, and penetrated into the heart of the enemy's country, in order to join the forces of Valens. Before, however, he could reach him, that emperor had been defeated and slain at the battle of Adrianople. Gratian now felt that he must take the most vigorous measures against their common enemy, and immediately called from his retreat Theodosius, son of the general who had suffered under his harsh displeasure, and placed him at the head of a separate army, with which he was enabled to destroy a large body of Sarmatians, who were on their march to join the Goths. Gratian himself proceeded to Constantinople, where he recalled those orthodox bishops who had been banished by Valens, and he also issued some edicts relative to the exercise of religion. As Valens had left no male heirs, his nephew, disregarding the suggestions of personal ambition, filled the vacant throne to the satisfaction of all, by raising Theodosius to a station, for which his talents were peculiarly adapted. This was in the year 379, after which Gratian returned to Italy, and in his journey he had an opportunity of being benefited by the instructions of the celebrated Ambrose, at Milan, which proved beneficial to the orthodox, but occasioned new restrictions upon those who were regarded as sectaries. After this he continued for some length of time to attend to the defence and concerns of the empire, and is highly applauded for almost all the amiable qualities which have decorated the best of sovereigns. Still it was feared that his good principles were rather the effect of able and virtuous advisers, than the spontaneous result of fixed habits. What the best friends to their country feared, proved to be the real fact: he suddenly fell into snares of unmanly pleasures, spent much of his time in indeliberate

frivolous amusements, which proved not only injurious to his subjects, but, in the end, ruinous to himself. Hunting became his favourite pastime: to enjoy the pursuits of the chase, he neglected the duties incumbent upon him, as the sovereign of a great people, and those only became his favourites who were skilful in hunting. He offended the more sober part of his subjects, by appearing in the garb of a Scythian warrior, armed with a bow and quivers, and discontents were on the very point of embodying themselves into a serious shape, when a revolt took place among the legions of Britain, who, without hesitation, invested Maximus with the imperial diadem. Gratian attempted an opposition; but his own efforts were feeble, and these even were counteracted by the treachery of some of his officers. He had no sooner unfurled his banners, and put himself in a warlike posture, than he was deserted by his household troops. He had now no hope, and immediately fled with about 300 faithful troops towards the Alps. All the cities on his road manifested evident signs of disloyalty: they even refused him a shelter or admission into their towns, till he arrived at Lyons. Here, indeed, the gates were opened for his reception, but the hearts of the people were estranged to his cause, and upon the arrival of the cavalry of Maximus, the governor of the city betrayed the deposed emperor into the hands of the commander, who caused him to be put to death, as he rose from his supper. This was in the year 383, after Gratian had been on the throne nearly eight years. Gibbon. Univer. Hist.

GRATIAN, a Benedictine monk, who flourished in the twelfth century, was a native of Chiuli, in Tuscany, and embraced the monastic life at Bologna. Before his time, there had been many collections of canons and laws of the church, but they were so defective in matter and form, that they could not be conveniently explained, or even made use of as systems of ecclesiastical polity. Gratian undertook the task of compiling such a system, and after more than twenty years' labour he produced, in 1151, an abridgment of canon law, drawn from the letters of the pontiffs, the decrees of the councils, and the writings of the ancient doctors, which he entitled "Concordantia discordantium Canonum," or as it has been translated, "The Coalition of jarring Canons." In a new edition of this work, it was called "Decretum Gratiani," or "Gratian's Decretal." By this name it is generally known. Upon the first appearance of the work, it received the stamp of approbation from pope Eugenius III., who declared himself to be satisfied with its execution, that he commanded it to be publicly read in the schools. The professors of Bologna were the first who unanimously adopted it as a text book in their public lectures, and their example was soon followed by the professors of Paris, and, in short, by those of almost all the European colleges. It is, however, said to be full of errors, and in other respects extremely defective, but as it was calculated to support despotism, and to extend the authority of the Roman pontiffs, it was for four centuries appealed to as the standard of ecclesiastical law, and even in ages succeeding that dark period, it has occasionally been quoted with a degree of veneration and authority, to which it has no just title. It was used in MS. till 1472, when it was printed at Mentz: this edition was followed by impressions at Venice in 1476, and Paris in 1508. Another edition was printed at Rome under the auspices of pope Gregory XIII. in four vols. fol. on which a large portion of labour was bestowed in correcting its numerous imperfections. Anthony Angullin, archbishop of Tarragona, in Spain, published a valuable treatise "De Emendatione Gratiani,"

of which the best edition is that published at Paris in 1672 Moreri.

GRATICULATION, a term some writers use for the dividing a draught or design into squares, in order to the reducing it thereby.

GRATINGS, in a *Ship*, are small ledges of sawed plank, framed one into another like a lattice or prison grate, lying on the upper deck, between the main-mast and fore-mast, serving for a defence in a close fight, and also for the coolness, light, and conveniency of the ship's company.

GRATIOLA, in *Botany*, the diminutive of *gratia*, a grace or favour, the herb to which it is applied having been called, by the earlier botanical or medical writers among the moderns, *Gratia Dei*, the favour of God, because of its eminent virtues, which however are of a violent and cathartic nature. It is one of the plants which have been conjectured to yield the tincture called *eau medicinale*, so famous at present as a cure for fits of the gout, but this opinion, it seems, is contradicted by the proprietor of the secret.—Linn. Gen. 13. Schreb. 17. Willd. Sp. Pl. v. 1. 102. Vahl. Enum. v. 1. 88. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. ed. 2. v. 1. 42. Brown. Nov. Holl. v. 1. 435. Juss. 121. Lamarck. Illustr. t. 16. Gartin. t. 53.—Class and order, *Diandria Monogynia*. Nat. Ord. *Personate*, Linn. *Scrophulariæ*, Juss.

Gen. Ch. Cal. Perianth inferior, in five deep, awl-shaped or ovate, upright, permanent segments. Cor. of one petal, tubular, unequal; tube longer than the calyx, angular; limb small, in five deep segments, of which the uppermost is broadest, emarginate and reflexed, the rest straight and equal. Stam. Filaments four or five, awl-shaped, shorter than the corolla, the two or three lowermost shortest and barren, the two uppermost attached to the tube of the corolla; anthers roundish. Pist. Germ. superior, conical; style straight, awl-shaped; stigma with two lips, closed after impregnation. Peric. Capsule ovate, pointed, of two cells and four valves, the partition from the inflexed margins at two opposite sides. Seeds numerous, small.

Ed. Ch. Corolla irregular, reversed. Two stamens barren. Capsule superior, of two cells and four valves. Calyx in five deep segments. Stigma with two lips.

Linnaeus's *gratiola*, in the first edition of Sp. Pl. 17, chiefly depended on the original and primary species, the *officinalis*, for of the three others there defined, *dubia* is *Capriaria gratioides* of the second edition, and *Lindermia pyridioides* of his Mantissa 252; *virginiana*, though in his possession, was made a *Gratiola* chiefly on Gronovius's authority; and *peruviana*, though a genuine *Gratiola*, had then probably never been seen by Linnaeus at all, but was adopted from Feuillée. In the second edition *G. Monnieria* takes place of the *dubia*, and a wrong East Indian synonym is annexed to *virginiana*, but no further species are added. In the second Mantissa two new ones are described, *rotundifolia* and *hypopodis*, both from the East Indies, so that six species in all are enumerated in Syst. Veg. ed. 14. To these Willdenow has added eight more, chiefly East Indian, prudently declining to adopt three unseen ones from Walter's Flora Carolina. Vahl has far outstepped his predecessors, giving 31 species in all. Unfortunately a great share of these were described from dried specimens, their genus determined chiefly by habit, and their flowers or fruit not sufficiently investigated. Indeed several of them evidently differ from the original genus in various respects. Mr. R. Browe, a more critical investigator, has greatly reduced the genus in question, though he has described three entirely

entirely new species from New Holland. We shall confine ourselves to an account of such as are certain, with compendious remarks on a few of the rest.

1. *G. officinalis*. Linn. Sp. Pl. 24. Fl. Dan. t. 363. Woodv. Med. Bot. t. 47. Bulliard t. 130. Ehrh. Pl. Off. 11. (Gratiola; Matth. Valgr. v. 2. 58. Rivin. Monop. Irr. t. 106.)—Leaves ovato-lanceolate, serrated, five-ribbed, smooth, somewhat longer than the flower-stalks.—Native of moist places in Denmark, Germany, Switzerland, France, and Greece, flowering in June. The roots are perennial, rather creeping. Whole herb smooth. Stems annual, ascending or erect, twelve or eighteen inches high, leafy, round, pale and very sleek, generally simple. Leaves numerous, opposite, sessile, dotted, above an inch long, ovato-lanceolate, bluntish, with many shallow tooth-like serratures in the upper part, and five, rarely seven, parallel ribs, of which the middle one is the most considerable. Stipules none. Flowers pale lilac, with an orange tube, inodorous, scarcely an inch long, on simple, solitary, axillary stalks, which are generally about half the length of the leaves, often more, and bear a pair of bractæas close to the flower, by some taken for additional parts of the calyx; these are spreading and a little toothed.—This species, a stranger to Britain, is the original one, celebrated for its purgative virtues, whence the French call it Poor-man's herb, on account of its cheapness and efficacy. Indeed its use requires great caution, and a plentiful administration of warm water, butter, or oil, at the same time. A scruple of the dried herb is mentioned as a sufficient dose, but its uncertainty, and its emetic properties, have justly brought this medicine into disuse, there being so many more unexceptionable drugs for the same purpose. Its flavour is nauseous and intensely bitter.

2. *G. pilosa*. Mich. Boreali-Amer. v. 1. 7. Vahl. n. 16. (*G. peruviana*; Walt. Carol. 62.)—Leaves ovate, crenate, hairy as well as the stem. Flowers axillary, nearly sessile.—Native of moist places in South Carolina, flowering in May. Stem simple or branched, near a foot high, square, leafy, very hairy. Leaves ovate, not an inch long, somewhat heart-shaped and clasping the stem with their base, bluntish, with two or three distant teeth on each side, fringed, dotted, and hairy. Flowers nearly sessile, white, with a pair of spreading bractæas, which are fringed like the calyx.

3. *G. peruviana*. Linn. Sp. Pl. 25. (*G. latiore folio*, flore albo; Feuill. Peruv. v. 3. 23. t. 16.)—Leaves ovate oblong, toothed, downy, obscurely five-ribbed. Flowers axillary, sessile.—Native of Peru, Mexico, and the Brazils. The whole herb is more or less downy. Stem a span high, angular, mostly simple. Leaves oblong, somewhat ovate, various in breadth, bluntish, obscurely five-ribbed, the margin furnished with distant teeth. Flowers white, nearly or quite sessile, shorter than the leaves, with a pair of bractæas very like, and about equal to the calyx, strongly countenancing the idea of their being properly calyx-leaves.

4. *G. latifolia*. Brown n. 1.—“Smooth. Leaves ovate, obtuse, obscurely crenate or entire. Flowers sessile.”—Native of the neighbourhood of Port Jackson, New South Wales, and of Van Diemen's land.

5. *G. pubescens*. Brown n. 2.—“Clothed with glandular hairs. Leaves lanceolate, toothed. Flowers nearly sessile.”—Native of Port Jackson, the south coast of New Holland, and Van Diemen's land.

6. *G. p. dunculata*. Brown n. 3.—“Clothed with powdery down. Leaves lanceolate, toothed in their forepart, scarcely longer than the flower-stalk.”—Native of Port Jackson.

Mr. Brown announces the existence of a few unpublished

species, natives of North America, of which we know nothing further. He mentions the Linnæan *G. hypoleuca* and *rotundifolia* as species of *Lamberti* with two barren flammæ, undoubtedly a variable circumstance in this tribe, and constituting no generic distinction. *G. Mexicana* is his *Herpilis*, and has the appearance of a good genus.

With respect to some other species.

*G. limfilia*. Vahl. n. 4. (*Digitalis limfilia* Linnæi par-hellis; Tourn. Inst. 165.)—Leaves linear, entire. Flower-stalks axillary, the length of the leaves.—Native of Portugal. This seems an unquestionable *Gratiola*, near the *officinalis*, with which it agrees in quality, but differs in leaves, and in the flowers not being more than one-third the size of that species.

*G. lobulata* of Retzius, Vahl. n. 12, has neither the habit, calyx, nor bractæas of this genus.

*G. trifida*. Willd. n. 9, seems to agree in all those points with Mr. Brown's *Linnæi*, the *Hottentia indica* of Linnæus.

*G. lucida*. Vahl. n. 17. (*Capparia crassica* of Linnæus), is referred by Mr. Brown to *Torenia*, a genus hitherto not much understood.

GRATIOLA *officinalis*, *Hæly-Hyffops*, in the *Materia Medica*, is a plant to which various medical virtues have been ascribed. The first account of its cultivation in Britain, is that given by Turner in 1508, though it is said that the first botanist who mentioned it was Matthioli. It has a strong bitter nauseous taste, with but little or no odour; and its virtues are extracted more perfectly by aqueous than by spirituous menstrua. It resembles *digitalis* both in the shape of its flowers, and in its medicinal effects, and hence has been called *Digitalis minima*. It is certainly a powerful and active cathartic, and operates so violently as generally to induce vomiting; and on this account, Ciomet thought it to be a medicine adapted only to the more vigorous and robust constitutions. Many others, however, recommend it as a safe and useful purgative. But as its effects are uncertain, it should be administered with the precaution of a gradual increase of its dose. This plant has been commonly used in hydropical cases; and in moderate doses it is said not only to act as a hydragogue, but also to manifest a diuretic character; and instances of its good effects in ascites and anasarca are related by many respectable practical writers. Geiner and Bergin found a scruple of the powder to be a sufficient dose, as in this case it frequently excited nausea or vomiting; others have given it to half a dram, two scruples, a dram, and even more. The extract is said to be more efficacious than the plant itself, and exhibited in the dose of half a dram or a dram in dysenteries, produces the best effects. Koirzewski informs us, that in the hospital at Vienna, three maniac patients were perfectly recovered by its use; and in the most confirmed cases of lues venerea, it effected a complete cure. It usually acted by increasing the urinary, cutaneous, or salivary discharges. Woodv. Mat. Med.

GRATIOLA, in Geography, one of the smallest Canary islands. N. lat. 29 15. W. long. 13 17.—Also, one of the Azores islands, about 13 miles long and eight broad. It takes its name from its beautiful appearance, and fertility in corn, fruit, pasture, and cattle, with which it supplies Terceira, and several of the other islands. It is well peopled, and has a number of villages; and the coast is defended by forts. The chief place is La Plata. N. lat. 39 2. W. long. 27 56.

GRATITUDE, in Ethics, a virtue disposing the mind to an inward sense and outward acknowledgment of bene-

its received. This is a virtue in which the Egyptians pretended to excel all the rest of mankind. See EGYPT.

GRATIUS, in *Biography*, a Roman poet, furnished from the place of his birth Faliscus, was a contemporary of Virgil. They are both mentioned by Ovid in a single distich. The work by which this author is known, and for which he claims a short notice, is entitled "Cynegeticon," or the Art of hunting with Dogs. It was entirely unknown to the moderns till it was brought to light by Paul Manutius in 1534. This learned editor printed it from a MS. copy brought by Sannazaro from France. It is said to be written with a purity not unworthy of the Augustan age. The best edition is that of Leipzig 1659, 4to. with notes. It has been printed in the collection of "Rei Veneticæ Scriptores," 1728, and in Mattaire's "Corpus Poetarum." Gen. Biog.

GRATTAN, in *Agriculture*, a term applied provincially in some situations to such arable lands as are managed under a commonable state. But in other places, as in Cornwall, it is employed to signify the mowing of grass the first year, after the ground has been manured with sea sand; which is an operation that they denominate mowing in grattan. The stubbles of common fields are also frequently called grattans.

GRATZ, or GRAZ, in *Geography*, a town of the duchy of Stiria, on the river Muehr; containing several churches and convents, an arsenal, a castle on a rock, and an university founded in 1585. In this town is held the assembly of the estates; and in 1784, it was erected into an archbishopric on the suppression of that of Goritz. It is surrounded by walls. The French took it in 1797; 70 miles S.S.W. of Vienna. N. lat. 47° 10'. E. long. 15° 16'. — Also, a town of Silesia, called also *Hradetz*, in the principality of Troppau, situated on the Mora; four miles S. of Troppau. N. lat. 49° 47'. E. long. 17° 50'.

GRATZEN, a town of Bohemia, in the circle of Bechin; 37 miles S.S.E. of Bechin. N. lat. 48° 47'. E. long. 14° 43'.

GRAVA SELE, a town of Naples, in the Basilicata; 15 miles E. of Ven. fa.

GRAVATTEN, a town of Prussia, on the Curisch Nerung; 20 miles S. of Memel.

GRAUDENTZ, a town of Prussia, in the palatinate of Culm, on an island near the Vitula; anciently called Gredok; 14 miles N. E. of Culm. N. lat. 53° 28'. E. long. 18° 28'.

GRAVE, in *Grammar*, a species of accent opposite to acute. The grave accent is expressed thus ( ` ); and shews that the voice is to be depressed, and the syllable over which it is placed pronounced in a low, deep tone.

GRAVE, in *Music*, is applied to a sound which is in a low or deep tone.

The thicker the chord or string, the more grave the tone or note, and the smaller the acuter.

Notes are supposed to be the more grave, in proportion as the vibrations of the chord are less quick. See GRAVITY, in *Music*.

GRAVE is also an ingredient in the composition of divers terms in history and poetry. Thus we say *land-grave*, *burg-grave*, *marg-grave*, *pals-grave*, &c.

The word, in this sense, is formed of the German *gr. f.* signifying *comes*, *count*; called in the barbarous Latin *gravius* and *gravior*.

GRAVE is also used for a tomb, wherein a person deceased is interred.

GRAVE, Ital. (pronounced *gravy*) an adverb applied to slow movements in the second degree, more quick than *adagio*, and more slow than *large*. In adagio movements,

the time is usually counted by quavers, in grave, by crotchets. *Grave*, Ital. and *gravement*, French, not only imply a slow time, but a certain *gravity* in the execution.

GRAVE, in *Geography*, a strong town of Brabant, belonging to Holland, situated in a marshy country, on the S. side of the Meuse; 34 miles S.E. of Utrecht. N. lat. 51° 46'. E. long. 5° 41'.

GRAVE Creek, a creek on the Ohio in Virginia, 12 miles from Wheeling. N. lat. 39° 46'. W. long. 80° 55'. Near this creek is a mound of earth, evidently the work of art, called an Indian grave. Although no tradition remains, that the Indians buried their dead in this manner, these mounds, on examination, have been found to contain a chalky substance, supposed to be bones of the human kind.

GRAVE Harmonic, in *Music*, is a phenomenon thus described by the late Dr Robison: "The reinforcements of sound, which are called *beatings*, are noises. If any noise whatever be repeated with sufficient frequency, at equal intervals, it becomes a musical note of a certain determinate pitch. If it recurs 60 times in a second, it becomes the note *C-fa-ut*, or the double octave below the middle *c* of our harpichords, or the note of an open pipe eight feet long. Now there is a similar (we may call it the very same) reinforcement of sound in every concord. Where the pulse of one found of the concord beats the pulse of the other, the two sounds are more uniformly spread; but where they coincide, or almost coincide, the condensation of one undulation combines with that of the other, and there comes on the ear a stronger condensation, and a louder sound. This may be called a *noisi*; and the equal and frequent recurrence of this noise should produce a musical note. If, for instance, *c* and *a* are sounded together; there is this noise at every third pulse of *c*, and every fifth pulse of *a*; that is, 80 times in a second. This should produce a note which is a 12th below *c* and a 17th below *a*; that is, the double octave below *f*, which makes 320 vibrations in a second. That is to say, along with the two notes *c* and *a* of the concord, and the compound sound which we call the *concord of the Vith*, we should hear a third note FF in the bass. Now this is known to be a fact, and it is the *grave harmonic* observed by Rameau and Tartini about the year 1754, and verified by all musicians since that time."

Mr. John Gough gives the following account of grave harmonics. "When two sounds are heard in concert, the vibrations producing them are arranged in cycles, no one of which continues for a longer or shorter time than the rest; and their effect is perceived by the ear, which becomes sensible of their presence. For when each cycle of a series, separately considered, exceeds the twelfth part of a second, the sense of hearing recognizes each point of division made by the coincidence of the vibrations which separate the contiguous cycles; this circumstance enables the sense to contemplate these periods apart, and comprehend their origin. On the contrary, when the duration of a cycle belonging to a compound series does not exceed the twelfth part of a second, the interval proves too small to be measured by the ear: it therefore escapes notice in a separate state; for the points of division recur too frequently to be observed. When the auditory organ finds itself in circumstances answering to the preceding description, it has but one method to pursue; which is, to treat these derivative intervals in the same manner it treats all periods, which are singly too small for its comprehension; it therefore reduces them to a simple musical sound, corresponding in pitch to a string which vibrates once in the time of each successive cycle. A grave harmonic is on this account always a lower

note than any of its constituents, seeing the time of a cycle exceeds the greatest vibration that enters into the composition of it. The strength of a grave harmonic is also weak, when compared with the notes composing it, because these secondary sounds, being nothing more than certain unavoidable efforts of the imagination, they assume the character of a feeble sound, which is just strong enough to be heard in the company of one or more louder tones; for the power of the imagination is always inferior to external impressions, except in fits of insanity, when the organs of sense appear to be blunted by physical causes. The grave harmonics always keep the direction of the ears, let the position of the head be changed as often as you please, resembling in this circumstance a thrill piping note, called the ringing of the ears; which every one ascribes to a slight affection of the auditory duct, because it differs from external sound, it having no fixed direction. The grave harmonics agree with the ringing of the ears in this remarkable particular; which is a strong proof that their immediate cause is seated in the person of the hearer; and it is evident from the nature of things, that this cause originates in the mind." Nicholson's Journal, 8vo. vol. iv. p. 2.

We have been thus particular in quoting from two very able writers on the subject of the grave harmonics, or Tartinian sounds, in order to shew the foundation of the rules which we shall here give, for determining the grave harmonic of any given perfect consonance, viz.

1st. Find the number of vibrations made in one second of time by each of the given sounds: which, supposing C-fol-fa-ut, or c of the German tablature, or that on which the tenor cleff is placed, to make two hundred and forty complete vibrations, is obtained, by multiplying this number by the larger term of the ratio of the given sounds to C, and dividing the product by the smaller term of that ratio, if the given sounds lie above C, or the reverse if below it.

2d. Having thus obtained the vibrations of the given consonance, divide the larger number of them, by the larger term of the given consonance, and the smaller number by the smaller term, each of which, if the operation be rightly performed, will give the same result, and shew the number of oscillations of the pulses of the two given sounds in one second, and also the vibrations in that same period, of the grave harmonic sought.

3d. Compare the number of vibrations last found with each of the vibrations of the given consonance, and reduce their ratios to the lowest terms, which will then express the intervals, or distance, of the grave harmonic, below each of the given sounds.

By way of examples of these rules, we subjoin the following table, shewing the grave harmonic, and several other useful particulars, of the principal consonances in the octavo, above C-fol-fa-ut.

1	2	3	4	5	6	7	8	9	10	11	12	13
VII	B	$\frac{3}{2}$	450	30	$\frac{1}{2}$	c	XXII	3 VIII	$\frac{1}{2}$	c	XXVIII	3 VIII + VII
7th	bB	$\frac{4}{3}$	432	48	$\frac{2}{3}$	g	XVII	2 VIII + III	$\frac{2}{3}$	g	XXIII	3 VIII + II
VI	A	$\frac{5}{4}$	420	26 $\frac{2}{3}$	$\frac{3}{4}$	bb	XXIII	3 VIII + II	$\frac{3}{4}$	bb	XXIX	4 VIII
6th	G	$\frac{3}{2}$	400	80	$\frac{1}{2}$	f	XII	VIII + V	$\frac{1}{2}$	f	XVII	2 VIII + III
V	G	$\frac{4}{3}$	384	48	$\frac{2}{3}$	g	XVII	2 VIII + III	$\frac{2}{3}$	g	XXII	3 VIII
4th	F	$\frac{3}{4}$	360	120	$\frac{1}{4}$	c	VIII	VIII	$\frac{1}{4}$	c	XII	VIII + V
III	E	$\frac{3}{4}$	320	80	$\frac{1}{2}$	f	XII	VIII + V	$\frac{1}{2}$	f	XV	2 VIII
3d	bE	$\frac{4}{3}$	300	60	$\frac{1}{2}$	c	XV	2 VIII	$\frac{1}{2}$	c	XVII	2 VIII + III
3'	D	$\frac{4}{3}$	288	48	$\frac{2}{3}$	g	XVII	2 VIII + III	$\frac{2}{3}$	g	XIX	2 VIII + V
II	D	$\frac{3}{2}$	284 $\frac{1}{4}$	88 $\frac{2}{3}$	$\frac{3}{4}$	bb	XXXIV	3 VIII + 3 V	$\frac{3}{4}$	bb	XXXVI	5 VIII
II'	C	$\frac{3}{2}$	270	30	$\frac{1}{2}$	c	XXII	3 VIII	$\frac{1}{2}$	c	XXIII	3 VIII + II
2d	C	$\frac{3}{2}$	266 $\frac{2}{3}$	26 $\frac{2}{3}$	$\frac{3}{4}$	bb	XXIII	3 VIII + II	$\frac{3}{4}$	bb	XXIV	3 VIII + III
	C	$\frac{3}{2}$	256	16	$\frac{1}{2}$	g	XXVIII	3 VIII + VII	$\frac{1}{2}$	g	XXIX	4 VIII
	C	$\frac{3}{2}$	250	10	$\frac{1}{2}$	f	XXXIII	4 VIII + V	$\frac{1}{2}$	f	XXXIII	4 VIII + 2 III
			240									
Intervals, Major and minor.	Letters.	Ratios.	Vibrations in 1", of the Given Sounds.	Vibrations in 1", of the Harmonic Notes.	Ratios.	Letters.	Intervals.	Ditto.	Ratios.	Letters.	Interval.	Ditto.
Intervals below the Key or lower Note.								Intervals below the upper Note.				
Given Consonances.				Grave Harmonics, or Implied Sounds.								

The experiments of M. Tartini, the discoverer of these sounds, extended to ten of the consonances in our table above, viz. the V, 4th, III, 6th, 3d, VI, II, II', (second minor,) 2d, (greater semitone,) and minor semitone ( $\frac{1}{2}$ ), but in all of which he seems to have mistaken an octave, in assign-

ing the place of the harmonic in the scale, and has mentioned each of them as being higher by an octave than in our table. Mr. John Holden, the author of "An Essay toward a rational System of Music," printed at Edinburgh in 1807, p. 352, seems to have been aware of this latter circumstance,

but in page 350, lays down an inapplicable and false rule for calculating the place of the harmonic, or *implied found*, as he calls it; viz. "when two different founds are heard together, their combination always either really produces, or essentially implies, a third found, whose vibrations are equal to the difference of the vibrations of the two founds in the same time." Thus C 240, heard together with G 360, produces 120; which is  $c$  an octave below C, &c. Now it is observable, that this empirical rule will give the same results as ours above, only in such cases where the least terms of the ratio (in column 3) differs by *unity*; which is the case in eight of Tartini's examples out of the ten, but not with the VI or the 6th: which, according to Holden's rule, stand thus,  $400 - 240 = 160$ , and  $\frac{160}{400} = \frac{2}{5}$ , or the fifth below the key, instead of the XIIth (as Dr. Robison and we have calculated it above); also,  $384 - 240 = 144$ , and  $\frac{144}{384} = \frac{3}{8}$ , or the octave and fourth, or eleventh, below the upper note, instead of the XXII. It is not a little surprising that Mr. H. should have overlooked these glaring inconsistencies of his rule, with Tartini's experiments, on which he professes to have founded it; acknowledging, however, (p. 351.) that he is unable to discover any philosophical principles on which these phenomena can be explained, and of course unacquainted with the writings of the two authors, from whence we have extracted as above. We should not perhaps have thus adverted to Mr. Holden's essay, had it not been in other respects a most respectable work, and one through which these errors are likely to be widely disseminated among musicians, and were not the fanciful system of harmony, which he builds solely upon them, calculated to bewilder still further the musical student, who may happen to have but a slight knowledge of mathematics. Among the novelties of Mr. Holden's system, he pretends to prove, by means of the implied founds, (calculated by his rule,) that the minor third,  $\frac{1}{3}$ , is a "superfluous third," and not the fundamental less third of the scale, which he says is expressed by the ratio  $\frac{2}{3}$ , (though conceived probably, as he says, p. 371, by the ratio  $\frac{1}{6}$ ;) on which account we have introduced this comma-deficient minor third into our table, and when its harmonic is shewn to be  $b c$ , five octaves below the upper note of the consonance, instead of  $284\frac{1}{2} - 240 = 44\frac{1}{2}$ , and  $44\frac{1}{2} \div 284\frac{1}{2} = \frac{1}{64}$ , which expresses  $2$  VIII + 6th, or a minor twentieth below the upper note, as Mr. H.'s rule would have given it: whereas, had he used the true method of assigning the place of this harmonic or implied found, his boasted fundamental less third, (besides proving less agreeable to the ear *on trial*, p. 384, than  $\frac{1}{3}$ ;) must have been degraded from the rank of concords, as having an implied found more than three octaves below the lowest of its notes, which is one of the essential properties of concords, according to their new conceits.

Another result of these false principles in the Essay is, the admission of the integer 7 among harmonic ratios (though to the exclusion of  $5 \times 7$ ;  $7^2$ ,  $7^3$ , &c.  $2 \times 7$ ,  $2^2 \times 7$ , &c. page 347, and also of page 305, although 7, 11, 13, 19, &c. have real places in the *false* notes of the trumpet, horn, &c.), and the consequent introduction of what the author calls a GRAVE fourth (see that article), in his descending scale, page 316. According to which also, the acute or comma-redundant major sixth ( $\frac{5}{3}$ ), belongs essentially to the scale, instead of the true concord  $\frac{5}{3}$ ! We trust that we shall have performed an acceptable piece of service to the well-wishers to the harmonic science, in pointing out the source of such incongruous absurdities as the above; and hope, that in a second edition of this useful work nearly all which follows page 349 will be expunged, and consigned to its merited oblivion.

The grave harmonics found by the rules and table above, are occasioned by the coincidences of the vibrations of perfect consonances, or the *beats* of Mr. Sauveur, but since the *beats* of Dr. Robert Smith also, or those made by imperfect concords, when they occur oftener than 12 or 13 in a second, occasion a grave harmonic note to be perceived, and no theorems for calculating such beats, except that of Dr. Smith from the fractions of a comma of temperament, and Mr. Emerson's from the lengths of strings, having to our knowledge been published, we shall here supply that defect in our article BEATS, and give theorems for calculating the beats made by imperfect or tempered concords whose vibrations per second are given, viz.

Let N and M be the number of complete vibrations made in one second, by the grave and acute notes respectively, of the tempered concord whose perfect ratio is  $\frac{n}{m}$  (n being the least term, in its lowest number), and let b be the number of beats in one second of time.

Then, if the temperament be *sharp*,  $b = nM - mN$ , the beats required.

Or, if the temperament be *flat*,  $b = mN - nM$ , the beats required.

Take for example, the 3d in our table above, and we have  $N = 240$ ,  $M = 284\frac{1}{2}$ ,  $n = 5$ , and  $m = 6$ : and by the second theorem above  $6 \times 240 - 5 \times 284\frac{1}{2} = 17\frac{1}{2}$  the beats in one second: which are, it will be observed, just double the vibrations in column five of the table, and therefore the grave harmonic thus occasioned, is four octaves below the upper note of this comma deficient minor third. The above theorems for beats will be found of like easy application, in almost every instance of musical calculations.

GRAVE Intervals is a term applied by Mr. Maxwell and several other correct writers, to such consonances as are flattened or lowered by a major COMMA (see that article) and it is usual with them to distinguish such intervals by the grave accent thus, II', III', IV', V', VI', &c.; and on the contrary, to apply the acute accent to such as are sharpened or raised a major comma, as II'', III'', 4'', &c. and to call such acute intervals or comma redundant intervals, while those as much flattened are called COMMA deficient intervals, which see. Mr. Holden, a modern writer, has, however, applied this term to intervals lowered by what he calls a *bearing*, whose ratio is  $\frac{9}{4} = 11.94709 \Sigma + m$ . See GRAVE fourth, &c.

GRAVE fourth, according to Mr. Holden's system lately published, is an interval less than a perfect fourth, by what he calls a *bearing* (which is  $\frac{9}{4} = 13.94709 \Sigma + m$ ) having the ratio of  $\frac{1}{4} = 240.05291 \Sigma + 5f + 21m$  in Mr. Farey's new notation; its common logarithm is .8819006, 8792, its Euler's logarithm or decimal value of the octave is .3923175, and it contains 21.89039 major commas.

GRAVE proper semitone, is an interval in Mr. Holden's System of Music, whose ratio is  $\frac{1}{2} = 43.05291 \Sigma + f + 4m$ ; its common logarithm is .9788107, 1, and Euler's logarithm .070389, and the number of major commas 3.92754 which it contains.

GRAVEDO, in *Medicine*, a Latin term, derived from *gravis*, heavy, signifies that species of catarrh, which is usually called a *cold in the head*; and in which, together with a stuffing of the nostrils, and blunting of the voice, there is a sense of fullness and weight in the forehead. It is, according to Celsus, nearly synonymous with the *coryza* of the Greeks. See CATARRH. Celsus, de Med. lib. iv. cap. 2.

GRAVEDONA, or GRAVIDONA, in *Geography*, a town of Italy, in the department of the Lario, on the lake Como: 42 miles N. of Milan.

GRAVEL,



## GRAVEL.

**GRAVEL**, in *Agriculture*, a term frequently applied to a well known material of the small stony kind, the sizes of the particles of which vary from those of very small peas to cockles, and sometimes larger. They are often intermixed with other matters, such as sand, clay, loam, flints, pebbles, iron ores, &c. Hence there are *sandy, clayey, loamy, flinty, pebbly, ocrey* or *ferruginous* gravels, &c.

**GRAVEL**, in *Gardening*, is a small stony substance made use of for the purpose of constructing roads, walks and paths. Walks formed of this material are great ornaments to gardens and pleasure-grounds, as well as useful for common walking upon.

The best gravel for those purposes is that which is naturally composed of irregular pebbles and flints, having a moderate proportion of a yellowish or brownish sandy loam, to make it bind, and give colour. It is obtained in fields and commons, in many parts, at from one, to three or four feet under the surface, though not equally good in all parts, in respect to quality and colour, some having a greater or less proportion of pebbles, a larger or smaller proportion of loam, which is more or less sandy or clayey: it is the colour of the loam, or oxyd of iron, principally, which constitutes the beauty of gravel walks; that of a deepish yellow or reddish colour being the most eligible, as when formed into well-laid walks and rolled, it has an exceedingly beautiful and ornamental effect. Where such gravel can be procured within a moderate distance, and easy expence, it is preferable to all others in some parts. Gravel is of an iron-mould colour, or of a dusky brown hue, which may nevertheless be of a proper quality for walks where the colour is disregarded.

Whatever colour the gravel may have, its proper quality for walks is, a due proportion of moderate, light, sandy loam, to make it bind close and firm at all seasons; but not so redundant, or so clayey, as to be clammy and stick to the feet in wet weather, or so sharp and sandy as to become open and loose in dry weather.

In some places, no other gravel is met with but such as is very loose, sandy, or pebbly, and which has scarcely any binding materials amongst it; which kind never of itself binds, but always remains open and loose, being at all times disagreeable to walk upon; this may, however, be mended by a mixture of light sandy loam, where practicable, adding about one load to every two or three of gravel, casting them together, and turning them over two or three times, that they may be well blended and incorporated; and this, when formed into a walk, will often bind close, firm, and smooth at all seasons of the year.

In preparing the gravel for walks, it should not by any means be finely screened, as is often the practice: as it is dug out of the pit, it is only necessary to cast it up in a heap, or long ridge, all such large rough pebbles only as roll down being cleared away; as if screened from the stones, it partakes too much of the loam, so as always to stick to the feet at every flash of rain.

In purchasing gravel for walks, it is mostly from about two to five or six shillings or more per cart-load for three horses; though the price differs greatly in different parts, and according to the nature of the gravel, as well as the goodness of its colour.

In respect to the distribution of gravel-walks in pleasure-grounds, and gardens, for ornament or use, large ones are necessary to proceed parallel to the house, extending each way towards the side districts of the garden and ornamented grounds: according to the former style of gardening, a large walk of this kind was usually extended in a straight line from the front of the habitation along the middle of the pleasure ground, sometimes having grass plats continued on each

side, and sometimes spacious borders furnished with curious shrubs and flowers. But in modern designs these middle walks are rarely admitted, especially in spacious grounds, having nothing in front beyond the parallel habitation walk, but an open rural grass lawn, free from all interfections of walks, &c. However, a good walk closely parallel to the house is indispensably necessary, both for ornament and convenience, and from this side-walks should branch off, communicating with the other parts of the pleasure or garden-grounds; one in particular to be extended in a serpentine manner quite round the ground, others leading in the same manner through the interior parts, so as to have dry firm walking at all times to every part of the ground or garden, without coming upon the grass.

The dimensions for gravel-walks must be regulated according to the extent of the grounds or gardens, as from five to twenty feet or more in width; but all principal walks should be at least eight or ten feet wide; and in large grounds or gardens leading directly from the house, they should be ten, fifteen, or twenty feet wide at least. When the houses and gardens are very large, the main walks contiguous to the mansion are sometimes made thirty or forty feet wide; the boundaries on each side being sometimes in grass widely extended, and sometimes in borders for flowers and other curious plants, having either narrow verges of grass, or edgings of dwarf box, or thurst, on the sides of the walks.

In forming walks of this sort, they should be first staked out to the proper width, and then the boundaries formed, each side of equal level, corresponding to the adjacent ground; the cavity of the walk for the reception of the gravel being afterwards made, the whole space being dug out at least twelve inches deep, to allow for a proper depth of gravel, both to prevent weeds coming from the ground below, and worms from casting up the earth; as also to allow of a proper depth for turning the gravel occasionally when the surface becomes foul; the earth dug out to form the cavity of the walk may be used to raise and form the ground on each side, if necessary, which, and the edgings, should always be completed before the gravel is begun to be laid down into the cavity formed for it.

When the cavity has been thus prepared, any hard rubbishing materials may be laid in the bottom, several inches thick; such as coarse gravel or ballast, rough stony lime, brick, or other rubbish, which will greatly prevent worm-casts, and help to drain the moisture from the top of the walk in wet weather, and in winter preserve a dry surface: the proper gravel is then to be laid six or eight inches thick; in laying, raising the middle higher than the sides, in a gradual rounding form; which is not only necessary to throw off the wet, but also to give the walk a more ornamental appearance; the proportion to be observed in this is, for a walk of five or six feet width, an inch and a half of rise in the middle; for one of ten or twelve feet, two and a half inches; and for one of twenty feet, from three to four or five inches; the same proportion being regarded in other widths. At every ten or fifteen feet, as the work advances in laying, it is proper to tread, rake, and roll the gravel down, as it always rolls more firm and smooth: a half-inch stirred; it is also necessary, for fear of rain, especially in loamy gravel; for which reasons, more should never be laid in one day than can be finished off, except the rough laying. The treading should be performed regularly with the feet pretty close, taking short steps; so as to render every part equally firm, and not to sink in holes under the feet, in the work of raking and rolling. The raking should be performed regularly lengthways of the walk; and in the finishing

off or smooth raking, a wooden-headed rake without teeth is most eligible, or the back of any common rake; as by any of these, the surface may be rendered more regular and even without drawing off the requisite proportion of top pebbles, or raking them into holes or heaps; as the art of smooth-raking is to leave all the proper-sized top stones equally dispersed over the surface. As soon as any part is thus laid and raked, it should be well rolled both across and lengthways; and when the whole is laid, a good rolling should be given the whole length, repeating it till the surface is rendered perfectly compact, firm, and smooth; and after the first shower of rain, another good rolling should be given, so as to make it bind like a rock. This method should be practised with all walks made with these materials invariably.

The management afterwards is, occasional weeding, sweeping, and good rolling, once or twice a week, especially in the advanced part of spring, and all summer; and also occasionally in winter, in dry open weather; and when the surfaces become very foul, or over-run with small weeds or moss, as is often the case, they must be broken up in spring, and turned the surface to the bottom, and the bottom to the top, by which the weeds and moss will not only be buried, but the walks appear as fresh as when new laid. The custom of breaking up gravel-walks in the beginning of winter, and laying them up in rough ridges, to destroy weeds and moss, is not eligible for general practice, or only occasionally, where any walk is exceedingly overrun; it is mostly more advisable to permit all the principal gravel-walks to remain undisturbed, at least till the spring, when, if it appear necessary, the whole may be broken up, regularly turned, and re-laid in a neat manner.

The turning of gravel is a sort of slight digging, the foul surface being turned down, and the fresh up; some have it performed regularly once a year in the spring, in order to preserve the colour. In these cases, the laying, raking, and rolling, are performed the same as in the first constructing the walks.

The rolling should be performed once a week at least in summer, and if two or three times the more beautiful the walks will appear, and it will tend greatly to destroy weeds and moss; it is mostly a rule among gardeners to sweep and roll every Saturday. During the summer, it is of much advantage to give a good rolling after rain, which affords a compact smooth surface, and preserves the walks in good order.

GRAVEL, in *Geology*, is a term properly applied to those fabulous soils, or assemblages of worn and rounded stones, which are found scattered on the surface of the earth, in almost all situations. It is an essential character of gravel, that it shall contain rounded stones extraneous to the place where they are found, otherwise the breccia, rubble, and loosened rocks and strata near the surface, owing to the action of air, wet, and frosts, &c. will be confounded with it, as too often has happened, in the descriptions of countries. The earthy and smaller matters found among gravels, vary in different situations, in all degrees from clay to sand: and yet, if such alluvial mixtures contain rounded stones, and fragments with evident marks of attrition on them, they should, in describing such soils, all be denominated gravel, adding other words to distinguish the nature and quantity of their earthy mixtures; where rounded stones only are found, with little else among them, as on the sea beach often, and in some gravel-pits, such may be denominated very clean gravel; if a small admixture of sand, loam, (a mixture of sand and clay,) or clay, be found among the stones, such may be denominated clean sandy, clean loamy, or clean

clayey gravel: where a considerable portion of the mass is sand, loam, or clay, such should be called sandy, loamy, or clayey gravel: and lastly, where the earths greatly predominate, the terms very sandy, very loamy, or very clayey gravel should be used; or in place of these last, in extreme cases, alluvial sand, alluvial loam, or alluvial clay may be substituted: the last of which terms would apply to the horizontal earthy deposits or meadow soils, by the sides of rivers, the mud of lakes, &c. We have here made use of the term alluvial, in its strict and proper sense, as denoting matters worn, moved, dispersed, mixed, and deposited in water, in distinction from the regular or undisturbed matters of the terrestrial strata: which, though they shew evident marks of having been deposited in a fluid, the perfect homogeneity of each lamina of the strata, and their vast extension, without rude or accidental mixtures, shew that the laws which governed the two kinds of terrestrial deposit, were not less distinct and marked, than are the processes of the precipitation of matters before mechanically mixed and suspended in a fluid, and the crystallization of substances from menstria super-saturated therewith. During the deposition of the strata, all was tranquil and quiet, except the movements of animated beings, which occupied successively the vast subaqueous plains of strata: during the formation and deposition of the gravels, of all descriptions, all was violence and confusion, and apparently so continued for a long period of time.

No problem is of more practical and theoretical importance in geology, than whether gravel is any where found *under* regular and undisturbed strata? Were the decision of this question to be referred to the opinions of writers on geology, mineralogy, &c. there would be little room to doubt, from their description, that such is sometimes, nay frequently, the case; but Mr. William Smith, from having devoted great part of twenty years to the accurate discrimination of stratified and alluvial matters, on the principles above stated, after examining vast numbers of the deepest and most extensive wells, shafts, mines, quarries, &c. and conversing with quarrymen, miners, &c. who collectively have made an almost infinite number of observations, is decidedly of opinion, that no such case can be pointed out in England. It is true, that sandy, loamy, and clayey masses occur, with a very few rounded or broken and mixed stony fragments among them, so that the nicest discriminations are necessary to distinguish such, in some places, from stratified sand, loam, (or natural brick-earth) or clay; and under great thicknesses of such doubtful masses, beds of rounded and mixed stones are found, sometimes at very considerable depths, but in all such instances, the doubtful character has continued from the very surface downward, to such gravel-beds, and no where are regular strata of stone, clay, or sand found upon even these doubtful masses, when due caution is used in making and extending the observations. It is true also, that there are, in various parts of the British series of strata, siliceous, or grit-stone beds, and rocks, composed of distinct grains of flint, or crystallized quartz, of all sizes, from such as require a glass for viewing them, to others the size of a man's fist; and in several instances, contrary to the more common case, of small and sizeable, or uniform grains, which distinguish most of our grit-stones, there are beds in which grains, as fine as possible, are mixed with the largest mentioned above, and have, in the cliffs and places where these coarse stone-beds, or loose blocks of them, are seen exposed, so exactly the appearance, at first sight, of gravel-rock, or indurated sandy gravel, that it is no wonder they should have been so generally classed with the gravels. Those, however,

who, like Mr. Smith, and the writer of this article, will be at the pains to trace the blocks of coarse stone alluded to, to their natural bed, and to examine the newly cut, or broken faces of them, and their beds and accompanying strata, and of comparing them with the heterogeneous mixtures and uncertain and irregular stratification of the real gravel-rocks, of which there are great tracts in Nottinghamshire, Derbyshire, Leicestershire, Staffordshire, Cheshire, and others of the midland counties, in some places of immense thickness, will see abundant cause for distinguishing even the coarsest and most irregular of our grit-stone strata, from the superficial gravel-rocks above-mentioned, and, indeed, from alluvial, or water-worn mixtures of any kind. And such observers will be struck with surprize, that such a regular and constant law, as seems to have regulated the formation of grains of flint, of all the sizes mentioned, should not have been observed and referred to, for explaining the formation of coarse as well as fine grit-stones, and have guarded against our confounding them with the water-worn gravels. Accumulations of gravel are to be distinguished into native and foreign, according as the pebbles and earth and extraneous bodies among them, can be referred to known and adjacent strata, or consists of stones and earths not elsewhere found, or but in very distant countries. For it will be found, that except on the sea shore, where the waves continually carry away, and again throw up the stones, which fall from, or are washed out of the marine cliffs, that the gravel of no spot corresponds with the strata on which it is lodged, and if in any situations in land this should seem to be the case, it will probably be found, that those strata extend far to the east or south-east of the place where their alluvial remains are lodged, and the circumstances appear to be explainable, on the principle of a general moving of native alluvia from the south-east quarter towards the north-west quarter, as observed in the Philosophical Magazine, vol. xxxv. p. 135. It is a remarkable fact, that all the very coarse, and irregular grit-stone strata, which have been noticed by the writer of this article in England, precede or occur beneath a series of carboniferous strata, or coal-measures; the lowest being found in the first and third grit rocks of the great Derbyshire denudation, and the others occur, both above and below the grey lime rock, which forms the floor and border of the great South-Wales coal-field (Phil. Trans. 1806), also the floor and edges of the forest of Dean coal-basin, and the western edge of the Somerset and Gloucester, or Bath coal-field, the northern edge of the Newcastle-under-Lyme, or pottery coal-field, &c. And which fact it seems to be that Mr. Kirwan alludes to, under the name of semiprotolite in some of the cases mentioned pages 257, 293, 300, 307, 312, and 336, of his "Geological Essays:" it is plain, however, that these coarse grit-stones, under our coals, do not indicate the near approach of the fundamental rock of granite, as Mr. Kirwan would have us believe. We cannot close this article, without again adverting to the importance of accurately determining the alluvia found on different parts of every country, and of tracing their connection with the regular and continuous masses of strata on which they rest, and from whence they have been torn. Much information on the alluvia and strata of the midland counties of England will be found in Mr. Farey's Report on Derbyshire.

**GRAVEL Rock**, signifies a concreted or indurated mass of sandy GRAVEL, (see that article,) and is carefully to be distinguished from the coarse grit-stone strata, which it often closely resembles.

**GRAVEL Fossils**, is a term applied to such reliquia, or extraneous fossils, as are found in a rounded or worn state, or lodged among gravel, or alluvial mixtures, the ruins of

abraded and worn strata. See our article COAL, where the distinctions between this and other classes of extraneous fossils are explained.

**GRAVEL**, in *Medicine*, the popular term for the disorder occasioned by the formation of small calculous, or sand-like concretions in the kidneys and bladder. It is the *Nephralgia arvensis* of Sauvage; (see his Nosol. Method. Clin. VII. Genus XXV. Spec. 2.) and to be distinguished from the nephralgia *calculus* of the same nosologist, in which larger calculi, or *stones*, are formed and impacted in the kidneys, ureters, or bladder.

The symptoms which indicate the presence of gravel in the kidneys, or in the passages from the kidneys to the bladder, called the ureters, are chiefly a severe pain in the loins, which is often accompanied by a sense of numbness, extending down the thighs of the side affected, with a retraction of the testicle in the male, and with a sickness of the stomach, often amounting to vomiting. During the passage of the small calculus through the canal of the ureter, the detention and irritation occasioned by the calculus, especially if its surface should be rugged and uneven, excites those symptoms in a more or less severe degree, or for a longer or shorter duration, according to its size and form; and they suddenly cease when it has entered the bladder. Pain is again excited in the urinary organs, when the calculus either lies over the aperture, or enters the canal of the urethra, and a pain and difficulty of passing the urine is excited. These symptoms, attending the transit of a small stone from the kidney, or its expulsion from the bladder, constitute what is usually called a fit of the gravel. The more common forms of the disease, however, consist in the formation of a sort of sandy matter, of a red colour, which impedes the free passage of the urine, and occasions considerable pain in the attempt, as well as an aching pain in the loins, through the sympathy of the kidneys with the bladder. A whitish mucous matter is sometimes discharged with the urine, under both these forms of the disorder, probably from the irritation excited in the secreting vessels, that open on the internal surface of the bladder: the passage of the small calculi occasionally causes a laceration of the small blood-vessels, and bloody urine is therefore discharged.

The little calculi, excited in those cases, are sometimes of a bright red colour, and consist, as well as the red sand which passes with the urine, or is deposited from it, of the uric or lithic acid in a concrete state.

The gravel is a disease chiefly of advanced life. It is common in gouty habits, in which it often alternates with the paroxysms of gout. It has been observed, that it descends by hereditary transmission, like that disorder, and that of the children of gouty parents may have been attended with the gravel, while others have had the gout. It is a curious fact, also, that the concretions called chalk-stones, which are deposited in the joints of the gout, consist of the same substance as these gravelly concretions, viz. the uric acid. It is to be distinguished from the rheumatic affection of the loins, called lumbago, by the sickness which attends the more severe cases, the numbness of the thigh and retraction of the testicle, as well as by the mucous or bloody urine, the pain and difficulty of passing urine, and the appearance of the sandy matter in it.

Chemistry has enabled the physician to administer great relief to the sufferings occasioned by gravel. It is a testimony by chemical experiments, that the human excretions are capable of solution in, or combination with, various substances, led to the administration of such alkalis internally, as remedies for the disease: and, although it has not been found,

that the larger stones of the bladder are dissolved or diminished by the action of alkaline medicines, yet the smaller concretions appear to be prevented from forming, and great relief from the pain and irritation, under all the varieties of concretion, is produced by the use of them. Perry's solvent, Mrs. Stephens' medicines, and Chittick's Receipt for the stone, are all of the alkaline class. It is probable that these alkaline medicines operate principally on the fluids in the first passages, by neutralizing the acids occasioned by indigestion, rather than by passing in the circulation, and combining with the uric acid in the kidneys or bladder. This would appear, partly from the fact, that the carbonated alkalis are equally or even more beneficial than the pure or caustic alkalis, in relieving the symptoms of stone or gravel; but it is principally proved by a circumstance, recently ascertained by the experiments of Mr. Home and Mr. Brande, that the absorbent earths, especially magnesia, are considerably more efficacious in relieving those symptoms, and in diminishing the quantity of uric acid in the urine, than the alkalis themselves. The magnesia is to be given in moderately large doses, two or three times a day; and if it proves purgative to the bowels, a few drops of the tincture of opium may be added to it. (See *Philosoph. Transact.* part i. for 1810.)

Of the alkalis, it would appear that the potash is, on the whole, more beneficial in these complaints than the soda: the pure or caustic potash may be given freely, beginning with doses of fifteen or twenty drops, and gradually increasing it, well diluted with any thin drink; and it may be continued for a considerable time with perfect safety. But the carbonate of potash is not less useful, and, especially when dissolved in water saturated with carbonic acid gas, it is more agreeable, and probably more efficacious. The efficacy of these acidulous alkaline waters was at first indeed attributed to the carbonic acid which they contain, and not to the alkali. (See a Medical Commentary on Fixed Air, by Dr. Dobson.) The soda water acidulated by the same gas operates in a similar way, and is another agreeable mode of taking the medicine. Lime-water is likewise possessed of some remedial powers, but is less efficacious than the alkaline water.

All these aqueous liquors operate in some measure, perhaps, upon another principle; that of increasing the quantity of fluids which pass through the urinary organs, and thus of diluting the irritating uric salts, and consequently diminishing the distress which they occasion: and they may likewise operate negatively, by rendering the patient unable to drink the usual quantity of wine or other strong liquors. Other matters, which tend to increase the flow of urine, seem to relieve the symptoms of gravel, upon the principle of dilution; especially small doses of the nitrous æther, or spiritus ætheris nitrosi, of the pharmacopœias.

When extreme pain is excited, either by the passing of a small concretion along the canal of the ureter or of the urethra, opiates will afford a temporary relief to the sufferings of the patient, and will perhaps aid in relaxing any spasmodic contraction that may take place in these passages, and thus expedite the passage of the calculus. The same object may be promoted by the use of the warm bath, by fomentations to the loins and pubes, and by warm glysters.

For the modes of relieving the symptoms, connected with the presence of the larger calculi of the bladder, and of extracting these concretions by surgical means, see *STONE*:—see also *NEURALGIA* and *NEPHRITIS*.

**GRAVELAINAS**, in *Geography*, a town on the S.W. coast of the island of Negroponte, on the site of the ancient Eretria; 10 miles S. E. of Negroponte.

**GRAVELINES**, a sea-port town of France, in the department of the North, and chief place of a canton in the district of Bergues, situated in the English channel, at the mouth of the river Aa. Although it is not large, it is well fortified with battions, half-moons, and horn-work, and the adjacent country is intersected by canals, one passing to Dunkirk by Bourbourg, and another directly to Bergues. It was built in 1160, and ceded to France by the peace of the Pyrenées; 9 miles W.S.W. of Dunkirk. N. lat. 50° 59'. E. long. 2°.

**GRAVELLANO**, a town of Italy, in the department of the Gogna; 30 miles N. of Novara.

**GRAVELLING**, among *Farriers*, a disorder incident to travelling horses, occasioned by little gravel-stones getting in between the hoof and the shoe, which, settling to the quick, fret and fester the part.

It is cured by pulling off the shoe, drawing the place to the quick, picking out all the gravel, and poulticing the foot, rather than stopping it, according to the old practice, with horse-grease and turpentine poured in hot.

**GRAVELLY LAND**, a term applied to such land as rests upon a sub-stratum of the gravel kind, or which is much intermixed with that sort of material. This sort of land is generally light and dry when under the plough, but apt to burn in the summer season, when in the condition of grass.

The manures should be adapted to the particular nature of these lands; but where they are of the more light descriptions, they may be greatly improved by the use of marle, loamy clay, chalk, mud, and other similar matters, as well as different sorts of earthy composts. See *SOIL*.

**GRAVELLY Soil**, a term signifying that sort of soil, which is chiefly constituted of gravelly matters. See *SOIL*.

**GRAVEN**, in *Geography*, a town of Norway, in the diocese of Bergen; 42 miles S.S.W. of Bergen.

**GRAVENAU**, a town of Bavaria; 20 miles N. of Passau. N. lat. 48° 48'. E. long. 13 22'.

**GRAVENWERT**, a town of Bavaria; 15 miles N. of Amberg.

**GRAVER**, a steel instrument, serving to engrave on metals. The graver consists of four sides or faces, and the point usually terminates in a lozenge: in some it is round, and in others square. The round point is best for scoring lines, the square for cutting broad and deep, and the lozenge for more delicate and fine strokes and scratches. Le Bossé recommends those of a form betwixt the square and lozenge. See *ENGRAVING*.

The gravers should be made of the best steel, which must be drawn out into small rods with a charcoal fire. These rods, after having been cut into the proper lengths for gravers, should be softened, by heating them in a charcoal fire, and suffering them to cool very slowly: let them next be filed into the desired form, and brought back to a hard temper by heating them red-hot, and in this state dipping their ends into soft soap. This should be done in a perpendicular direction; for, if they be turned in the least degree obliquely, the graver will warp and be crooked. If the temper of the graver be too hard after this treatment, and prevent the whetting it properly to an edge, it may be softened, by laying its end on a large burning piece of charcoal till it begins to grow yellow, and then thrusting it into a lump of tallow, or dipping it in water; but if water be used, the graver must not be too hot. It may be known whether the graver be tempered to a proper hardness by touching the edge of it with a file, which, if any effect attends it, proves the temper to be too soft. The best proof of too great hardness is the breaking of the point

point in engraving; after which, if a new edge be made by whetting the graver, it will be frequently found very good without any other alteration. *Handmaid to the Arts*, vol. ii. p. 56.

The other end is fitted into a wooden handle.

Besides engravers, the seal-cutters, lock-smiths, gun-smiths, gold-smiths, armourers, spurriers, &c. likewise make use of gravers.

GRAVEROL, FRANCIS, in *Biography*, was born at Nismes in 1635. He was educated for the profession of the law, and practised, as an advocate, in the parliament of Toulouse, and in the presidial chamber of Nismes, and as director and secretary of the academy in the latter place. He was not only well versed in the studies connected with his profession, but deeply read in subjects of general literature, and particularly distinguished for his knowledge of medals and inscriptions. In religion he adhered strictly to Calvinistic principles, which impeded his advancement in life, and at length involved him in persecution. To avoid the lash of cruel laws he retired to Orange, but, not thinking himself safe there, he attempted to pass into Switzerland. In his journey he was apprehended by the officers of the civil power, and thrown into prison in the citadel of Montpellier. He was, after a long confinement, liberated, and died in the year 1694. His works consist of several dissertations on particular medals, and other monuments of antiquity. His "Observations on the Arrests of the Parliament of Toulouse," in 4to. were much esteemed. He was well known to all the learned in Europe, and was admitted a member of the *Ricovrati* at Padua. At his death he had in hand some other literary works. *Moreri*.

S'GRAVESAND, WILLIAM JAMES LE, in *Biography*, was born at Bois-le-Duc in the year 1688. Having received the elements of learning at a common school, he was sent to Leyden to study the civil law, but he soon exhibited a decided taste for philosophical and mathematical studies, which he determined to pursue in preference to the learning of the courts. He produced, when he was only eighteen years old, an excellent "Essay on Perspective," which gave him a considerable reputation among the mathematicians of the age in which he flourished. In 1707 he took his doctor's degree, quitted the university, and settled at the Hague, where he practised at the bar, and cultivated an acquaintance with learned men. He joined some other persons in conducting a periodical work, entitled "Le Journal Litteraire," which was continued without interruption from the year 1713 to 1722. S'Gravesand contributed to it the original dissertations relating chiefly to geometry and physics. Among the discourses most worthy of notice, and which were original pieces of his own composition, were the following, "Remarks on the Construction of Pneumatical Engines;" and "An Essay on the Collision of Bodies," which was attacked by Dr. Clarke and other learned men, on account of its opposing the principles of the Newtonian philosophy. In 1715 the States General sent an embassy to England, to congratulate king George I. on his accession to the throne of Great Britain. S'Gravesand was on this occasion appointed secretary to the persons composing this body, and during his stay in London, he became intimately acquainted with sir Isaac Newton, and was, upon the recommendation of that great man, admitted a member of the Royal Society. Upon his return to Holland, he was appointed professor of mathematics and astronomy at the university at Leyden. He immediately undertook to teach and illustrate the Newtonian philosophy to the students of the university, and in 1734 he had the additional professorship of philosophy conferred upon him.

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So great were his exertions in the several duties of his office, and in preparing for publication his several works on the sciences, that he injured his constitution, and finally sunk under his labours in 1742, when he was only fifty-four years of age. His principal publications were: (1) "Philosophia Elementaria Mathematica, Experimentis confirmata, seu Introductio ad Philosophiam Newtonianam," which contains of the author's lectures: (2) "Matheseos Universitatis Elementa," containing a system of algebra for the use of students, with a commentary on Newton's Universal Arithmetica: (3) "Philosophia Newtoniana Institutionum," which is an abridgement of his Elements of Physics: (4) "Introductio ad Philosophiam, Metaphysicam, et Logicam Cartesianam." His mathematical and philosophical works, excepting the first article, were collected and published at Amsterdam, in 2 vols. 4to., with an account of the life and writings of the author. The private character of S'Gravesand was highly respectable and amiable: his morals were exemplary, and he was beloved for his generosity, benevolence, and obliging manners. He was consulted by the ministers of the republic on all matters of finance, and was of great service to them in deciphering and detecting the secret correspondence of their enemies.

GRAVESANDE, in *Geography*, a town of Holland, distant about four miles from the sea, six miles W.S.W. of Delft.

GRAVESEND, a town in the hundred of Tonbridge, in the county of Kent, England, consists of several streets, built on a declivity leading to the Thames; and is partly situated in the parish of Milton, which adjoins to that of Gravesend on the east side. The early prosperity of this town received a considerable check in the reign of Richard II., when the French and Spaniards sailed up the Thames in galleys, plundered and burned many of the houses, and took a great number of the inhabitants prisoners. To alleviate the loss, the king was induced to give the townspeople a legal claim to the water-passage to London, by a grant to the abbey of St. Mary le Grace. In the tenth of queen Elizabeth the parishes of Gravesend and Milton were incorporated by her letters patent: but the principal charter was granted by Charles I. in the year 1632. The chief officer, who had before this time been called the portreeve, was by this charter constituted mayor; and in him, twelve jurats, twenty-four common councilmen, a seneschall or high steward, and other inferior officers, the government of the town is now vested. The liberty of holding two additional weekly markets on Wednesdays and Saturdays, and an annual fair of four days, was also granted at the same time, together with a full confirmation of the exclusive privilege, conferred by king Richard, of conveying passengers and goods by water to the metropolis. In August 1727 the greater part of the town was destroyed by a fire, which commenced in a barn-yard adjoining to the church, and consumed that fabric, with about 120 houses, besides out-buildings, stables, &c. The present church, which is dedicated to St. George, was erected on the old site in the year 1732, under an act of the fourth of George II. which appropriated 5000*l*. for that purpose, from the duties on coals and culm, levied under the acts of the ninth and tenth of queen Anne, for building fifty new churches in or near London.

Gravesend has been greatly improved since the year 1754, when a new town-hall, having an area beneath where the poultry market is kept, was erected by the corporation. In 1767 a new wharf, crane, and causeway, were made, the expence of keeping which in repair is defrayed by inland tolls for cranage and wharfage. The increase of the trade

population, and buildings has been particularly rapid since the middle of the last century. Under the late act, the number of inhabitants was returned at 2483, and that of houses at 412; yet these numbers are very incorrect, and the population can scarcely amount to less than 4000, nor the number of houses be fewer than 700. Most of the inhabitants are engaged in maritime pursuits or employments. A small manufactory for cables and ropes is carried on here; and about the year 1780, a yard for ship-building, which had long been disused, was hired by a quaker, named Cleverly, and several men of war and frigates, besides smaller vessels, have been built here. About eighteen or twenty smacks find employment in the cod and haddock fishery; and most of the Ditch turbot vessels lie off this town, and send their cargoes to the London markets in small boats. Most of the East and West India trade, and, indeed, of the outward-bound ships in general, are supplied with live and dead stock at Gravesend; and also with vegetables; about eighty acres of ground in the two parishes being cultivated for that purpose, and for supplying the London markets with asparagus, which is remarkable for its size and fine flavour. Gravesend is situated 22 miles E. from London. Hasted's History of Kent, vol. i. 8vo. Beauties of England and Wales, vol. vii.

GRAVESEND, a township and village of America, in Long island, New York, seven miles from the city, containing 489 inhabitants.

GRAVIMETER. See HYDROMETER.

GRAVINA, DOMENICO DA, in *Biography*, who flourished in the fourteenth century, was a native of Gravina, in the kingdom of Naples. He was by profession a notary, but in literature an historian. He seems to have taken an active part in the civil wars which agitated his country at that period, and on account of the side which he espoused, he was stripped of all his property, and driven into exile with his wife and children. He wrote a history of Naples in the Latin language, and likewise a history of the transactions in that part of Italy during his own times, from 1330 to 1350. A fragment of this work only is in existence, the beginning and end being lost; it is, however, reckoned a valuable document for the fidelity of the narration, and is to be found in Muratori's collection of Italian historians.

GRAVINA, JOHN VINCENT, was born in 1664 at Rogiana, a castle in Calabria. He enjoyed all the advantages of a very liberal education, and became well versed in the learned languages; geometry, physics, history, and antiquities. He also made himself acquainted with the principles of theology. Having thus attained to a general knowledge of the learning of the times, he went to Naples to study the civil and canon law. After this he passed to Rome, and lived with Paul Coarso of Turin. He was one of the original founders of the academy of Arcadi, and had the charge of drawing up their laws in the style of the Roman tables. He arrogated to himself the merit of having devised these laws, a circumstance which involved him in a quarrel with the other members, particularly with Crescimbini, the founder of the society, so that these two learned men were for several years at the head of two factions which divided the body. In 1698, he was nominated professor of civil law at the college of Sapienza, and, in five years after, he succeeded to the chair of the canon-law. His method of instruction was excellent; he avoided trifling verbal disputes, and mere scholastic speculations, and entered into the spirit of the laws, illustrating their theory by observations drawn from ancient writers, and by a criticism founded on his extensive erudition. This mode of

instruction excited much public attention, but the haughtiness of his temper prevented him from being popular. By the public at large, his manners could be no obstacle to the celebrity of his writings, and his reputation daily increased. His works were numerous, and the subjects on which he treated very various. His "Origines Juris Civilis," has been ever esteemed a classical performance, lucid in its arrangements, and replete with solid and very important learning. This was first published at Leipzig in 1708, and afterwards there was a more correct edition of it in 1713; to the latter impression was subjoined a treatise "De imperio Romano," esteemed a master-piece, though not free from error. Gravina undertook to establish a poetical code, for which purpose he wrote two books, entitled "De la Region Poetica;" one entitled "Della Tragedia," and a treatise "De Institutione Poetarum." Another work was printed contrary to his inclination; this was his "Institutes of Civil and Canon Law," which he intended to have revised and given in a corrected and augmented form. In 1714, Gravina re-visited his native country, where he staid about two years and then returned to Rome. He was preparing to depart for Turin, whither he had been invited by the duke of Savoy, in order that he might take the general direction of the learned institutions, when he was seized with an illness which carried him off in 1718, in the arms of his beloved pupil Metastasio, whose poetical talents he first discovered and cherished, and whom he left heir of all his property out of Calabria. Gravina was of a contentious disposition, excessive in his praise of persons whom he esteemed, and also in his censure of those who offended him; he was arrogant, from a high opinion of his own superiority. This created him many enemies, with whom he was perpetually at war. Of his great learning there can be no doubt; but with respect to his poetical talents, it has been remarked, that he was more successful as a legislator than as a practiser in the art; for his five tragedies written on the model of the ancients were not favourably received by the public, and the author's angry expostulation, proving that they ought to have been applauded as usual, was totally inefficacious. Moreri.

GRAVINA, in *Geography*, a town of Naples, in the province of Bari, the see of a bishop, suffragan of Acerenza, 24 miles S. of Trani.

GRAVINA'S *Islands*, a range of islands in the N. Pacific ocean, each from 20 to 50 miles in circumference, interspersed with some islets, stretching N. W. to S. E. about 40 miles, between the duke of Clarence's strait and the canal of Revilla Gigedo. N. lat. 54 52' to 55 27'. E. long. 228 24' to 229 5'.

GRAVING, the act or art of cutting lines, figures, and other designs, on metals; more properly called *engraving*; which see.

GRAVING, in the *Sea Language*, is the bringing a ship a-ground, and then burning off with furze, reed, or broom, all the filth and foulness that stick to her bottom without board, in order to pay her anew. See BROOMING and CAREENING.

GRAVING-dock, or *Dry Dock*, is a place from which the water can be let out or pumped, after ships and boats are floated into it to be cleaned or repaired; sometimes, graving-docks are above the level of the water, and boats are dragged upon inclined planes into the same. By the sides of tidal rivers or harbours these are constructed with strong close gates meeting in an angle to shut out the tide; which gates are furnished with a small sluice or valve for emptying or filling the dock, when a vessel has entered at high water,



or is about to leave the dock at such time. See DOCKS, and CANAL.

GRAVISKOI, in *Geography*, a fortress of Russia, in the government of Kolivan, on the Irtysh; 240 miles S. S. W. of Kolivan. N. lat.  $50^{\circ} 15'$ . E. long.  $75^{\circ} 14'$ .

GRAVITAS, Βαρύτης, in the *Ancient Music*, was used to signify a sound produced by the remission or falling of the voice. Gravitas differs from remission, as the effect from the cause.

GRAVITAS is also used to denote the state of a woman going with child. See PREGNANCY.

GRAVITATION, the exercise of gravity, or the action which a body exerts on another body by the power of gravity. It is sometimes distinguished from gravity. Thus, Maupertuis takes gravity for that force by which a body would fall to the earth supposed at rest; and gravitation for the same but diminished by the centrifugal force. See figure of the earth determ. p. 206 of Mr. Murdoch's translation.

It is only gravitation, or gravity thus blended with the centrifugal force, that we can measure by our experiments. However, methods have been found to distinguish what remains of primitive gravity, and what has been destroyed by the centrifugal force.

It is one of the laws of nature, discovered by sir Isaac Newton, and now received by most philosophers, that every particle of matter in nature gravitates towards every other particle; which law is the hinge on which the whole Newtonian philosophy turns. See NEWTONIAN *Philosophy*.

What we call *gravitation*, with respect to the gravitating body, is properly called *attraction* with respect to the body towards which the other gravitates.

The planets, both primary and secondary, and also the comets, do all gravitate towards the sun, and towards each other; and the sun towards them: and that in proportion to the quantity of matter in each.

The Peripatetics, &c. hold, that bodies only gravitate when out of their natural places, and that gravitation ceases when they are restored to the same, the intention of nature being then fulfilled. The final cause of this faculty, as they maintain, is only to bring elementary bodies to their proper place, where they may rest. But the moderns shew, that bodies exercise gravity even when at rest and in their proper places.

This is particularly shewn of fluids; and it is one of the laws of hydrostatics demonstrated by Mr. Boyle and others, that fluids gravitate *in proprio loco*, the upper parts pressing on the lower, &c.

For the laws of gravitation of bodies in fluids specifically lighter, or heavier than themselves, see *Specific GRAVITY, FLUID, &c.*

GRAVITATION, *Theory of Universal*. Newton is very justly considered as the author of this great hypothesis, though several preceding and cotemporary writers seem to have formed conjectures on this subject that did not differ very widely from the truth. From the time of Kepler it had every day become more and more evident, that some mechanical cause had a very material influence on the laws of the planetary motions. The problems which the discoveries of that great astronomer had left for future ages to solve were these: Why do the planets and satellites describe *elliptic* orbits, the former round the sun, the latter round their primary planet? Why is the centre of motion in the focus rather than in the centre of the ellipse? Why are equal areas described in equal times about the centre; and what can be the cause of that remarkable law that is found

constantly to subsist between the distances of the planet from the sun and the times of their revolution?

Des Cartes first attempted a solution of these difficulties, by suggesting a simple mechanical cause. He supposed the existence of a subtle fluid, which, though imperceptible to the senses, was in constant motion round the sun, and that it involved the planets in its powerful agency. This theory, on its first enunciation, does not seem deficient in plausibility, but upon more careful examination, it is found incapable of explaining any one astronomical phenomenon correctly, and indeed the action of such a fluid would produce effects in many cases exactly the reverse of what it was intended to explain. The spirit of rational enquiry that now began to be exerted on all philosophical subjects, rendered this theory of short duration.

Kepler at a much earlier period had formed more correct opinions on this subject than Des Cartes: indeed he seems to have had a very distinct idea of the existence of gravitation, though he never could have been aware of its agency being so extensive, or that it would ever explain in so satisfactory a manner as it has done his own great discoveries. Gravity, he says, in his "Commentary on Mars," is only a mutual and corporeal affection between similar bodies. Heavy bodies do not tend to the centre of the world, but to that of the round body of which they form a part; and if the earth were not spherical, heavy bodies would not fall towards its centre, but towards different points. This conjecture has been fully verified by theory and observation; the earth appears not to be a perfect sphere, and accordingly a plumb-line does not tend to the exact centre of gravity of the whole earth, but to a point considerably remote from it, as has been explained under DEGREE, EARTH, *figure of*, &c. &c.

Kepler likewise strongly suspected that the attraction of the moon was the cause of the tides, and that the lunar irregularities arose from the action of the earth and sun. Perhaps, from the earliest times, some indistinct conceptions are to be occasionally traced in different authors concerning the existence of this universal principle.

Fermat, who preceded Kepler, affirmed, that the weight of a body was the sum of the tendencies of all its particles to all the particles of the earth; and Kepler was of opinion that two bodies left alone in free space would approach each other with velocities inversely proportional to their masses or quantities of matter.

A short time previous to the great discovery of Newton, Dr. Hooke made a still nearer approach to the truth. At a meeting of the Royal Society, May 3, 1668, he expressed himself in the following manner: "I will explain a system of the world very different from any yet received, and it is founded on the three following positions:

1. That all the heavenly bodies have not only a gravitation of their parts to their own proper centres, but that they also mutually attract each other within their spheres of action.

2. That all bodies having a simple motion will continue to move in a straight line, unless continually deflected from it by some extraneous force, causing them to describe a circle, an ellipse, or some other curve.

3. That this attraction is so much the greater as the bodies are nearer. As to the proportion in which these forces diminish by an increase of distance, I own I have not yet discovered it, although I have made some experiments to this purpose. I leave this to others who have time and knowledge sufficient for the task."

This is a very precise enunciation of a proper philosophical theory. The phenomenon, the change of motion, is con-

sidered as the mark and measure of a change of force, and his audience is referred to experience for the nature of this force. He had before exhibited to the society a very pretty experiment contrived to shew the nature of this force. A ball, suspended by a long thread from the ceiling, was made to swing round another ball, laid on a table immediately below the point of suspension. When the impulse given to the pendulum was nicely adjusted to its deviation from the perpendicular, it described a perfect circle round the ball on the table; but when the impulse was very great, or very small, it described an ellipse, having the other ball in its centre.

Hooke shewed that this was the operation of a deflecting force proportioned to the distance from the other ball. He added, that although this illustrated the planetary motions in some degree, yet it was not suitable to their case: for the planets describe ellipses, having the sun not in their centre but in their focus. Therefore they are not retained by a force proportional to the distance from the sun.

The exalted genius of Newton can suffer no diminution by the enumeration of the above opinions, for though the idea of such a principle as gravitation was not suggested first by Newton, yet so very obscure were the notions of even the most enlightened philosophers on this subject, that it had never been successfully applied to the explanation of a single astronomical phenomenon.

So intimately connected is this great discovery with the history of the human mind, that every known circumstance relating to it has been recorded with the greatest care. Dr. Pemberton relates that Newton, in the year 1666, having retired from Cambridge to the country on account of the plague, was there led to meditate on the probable cause of the planetary motions, and upon the nature of that central force that retained them in their orbits. It then occurred to him that possibly the same force, or some modification of the same force which caused with us a heavy body to descend with a certain velocity to the earth, might likewise retain the moon in her orbit by causing a constant deflection from a rectilinear path. Before, however, this conjecture could be put to the test of calculation, it was necessary that Newton should have formed some conditional hypothesis relative to the modification of the force with respect to the distance. That any agency emanating from a central point should decrease as the square of the distance from that point increases, is an hypothesis so natural, that we cannot be surprized that Newton should have selected it; but whether or not he had previously tried any other, or whether he had even at this time deduced it from the nature of the planetary orbits, does not now appear. The calculation which it was necessary to institute, we shall give with great minuteness in its proper place; it is therefore only necessary to remark at present, that it requires that the proportion between the radius of the earth and the lunar orbit should be exactly known. When Newton first attempted to verify this hypothesis, these requisite data had not been exactly determined, and a slight discordance between the result of the calculation and the supposed fact, induced him for a time to abandon his hypothesis. This circumstance has, with great propriety, been recorded as a striking instance of the cool and dispassionate frame of mind which this great philosopher preserved, at a moment when he had flattered himself with the hope of having discovered one of the most important secrets of nature.

Some few years afterwards he was again tempted to renew these calculations, as in this interval a degree of the meridian had been measured in France by Picard. This second attempt succeeded. It is related, that towards the

end of the calculation he became so much agitated, as to be obliged to request a friend to assist him in finishing it; and certainly a moment of greater importance in philosophy will never be recorded in the annals of science.

The computation which was made by Newton to determine the identity of the force of terrestrial gravity, with that which retains the moon in her orbit, is still a subject of great interest to astronomers, as they now reverse the process; and taking the theory of gravitation as admitted, they deduce from the same computation the distance of the moon from the earth. We shall give it in the words of La Place.

The force which at every instant deflects the moon from the tangent of her orbit, causes it to describe, in one second, a space equal to the versed sine of the arc which it describes in that time; since this sine is the quantity that the moon at the end of a second deviates from the direction it had at the beginning. This quantity may be determined by the distance of the earth, inferred from the lunar parallax in parts of the terrestrial radius; but to obtain a result independent of the inequalities of the moon, we must take for the mean parallax that part of it which is independent of these inequalities. This part is, according to observation,  $50' 54''.9$ , relatively to the radius drawn from the centre of gravity of the earth, to the parallel, of which the square of the sine of the latitude is equal to  $\frac{1}{4}$ . We select this parallel because the attraction of the earth, on the points corresponding to its surface, is at the distance of the moon, very nearly equal to the mass of the earth divided by the square of the distance from its centre of gravity. The radius drawn from a point of this parallel to the centre of gravity of the earth is 6369374 metres, from whence it may be computed the force which solicits the moon towards the earth causes it to fall  $0''.00101727$  in one second of time. It will be shewn hereafter, that the action of the sun diminishes the lunar gravity  $\frac{1}{342}$ th part. The preceding height must therefore be augmented  $\frac{1}{342}$ th part, to render it independent of the action of the sun; it then becomes  $0''.00102011$ . But in its relative motion round the earth, the moon is solicited by a force equal to the masses of the earth and moon divided by the square of their mutual distance; therefore to obtain the height which the moon would fall through in one second, by the action of the earth alone, the preceding space must be diminished in the ratio of the mass of the earth to the sun, and of the masses of the earth and moon; but by the phenomena of the tides, it appears that the mass of the moon is equal to  $\frac{1}{81}$  of that of the earth, multiplying therefore this space by  $\frac{81}{80}$ , we have  $6''.00100300$  for the height which the moon falls through in one second by the action of the earth.

Let us now compare this height with that which results from observations made on the pendulum. Under the parallel above-mentioned the length of the pendulum vibrating seconds is equal to  $3''.65706$ ; but on this parallel the attraction of the earth is less than the force of gravity by  $\frac{1}{2}$  of the centrifugal force due to the motion or rotation of the earth at the equator; and this force is  $\frac{1}{25}$ th part of that of gravity; the preceding space must therefore be augmented  $\frac{1}{25}$ th part, to get the space due to the action of terrestrial gravity alone, which on this parallel is equal to the mass divided by the square of the terrestrial radius: we shall therefore have  $3''.66553$  for this space. At the distance of the moon it should be diminished in the ratio of the square of the radius of the terrestrial spheroid to the square of the distance of the moon: for this purpose it is sufficient to multiply it by the square of the tangent of the lunar parallax, or  $56' 55'' 2$ , this will give  $0''.00100483$  for

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for the height which the moon should fall through in one second by the attraction of the earth. This quantity, derived from experiments on the pendulum, differs very little from that which results from direct observation of the lunar parallax; to make them coincide, it is sufficient to diminish the parallax 2, and to reduce it to 56' 53" 3. This is the parallax resulting from the theory of gravity, differing only  $\frac{1}{100000}$ th part from that derived from actual observation, to which La Place thinks it preferable, considering the exactness of the elements from which it is computed. It would be sufficient to diminish a little the mass of the moon to obtain, by this theory of gravity, the same parallax that is given by observation: but all the phenomena of the tides concur in giving this satellite a mass more considerable, and very nearly such as has been used in the above computation. But however that may be, the small difference between the two parallaxes is within the limits of the errors of observation, and of the elements employed in the calculation. It is then certain that the force which retains the moon in its orbit, is the terrestrial gravity diminished in proportion to the square of the distance.

Having thus shewn how the nature of the force which retains the moon in its orbit is investigated, it next remains to inquire if the same force of gravity pervades the rest of the solar system. The same great mathematician, above quoted, observes, that "of all the phenomena of the solar system, the elliptic motion of the planets, and of the comets, seems the most proper to conduct us to the general law of the forces by which they are animated.

Observation has shewn, that the areas described by the radii vectores of the planets and comets about the sun are proportional to the times. Now we see, in the article *CENTRIFUGAL FORCES*, that, for this to take place, the force which deflects the path of these bodies from a right line must constantly be directed towards the origin of their radii vectores. The tendency of the planets and comets to the sun is therefore a necessary consequence of the proportionality of these areas to the times in which they are described. To determine the law of this tendency, let us suppose that the planets move in circular orbits, which supposition does not greatly differ from the truth. The squares of their real velocities will then be proportional to the squares of the radii of these orbits, divided by the squares of the times of their revolutions. But, by the law of Kepler, the squares of the times are to each other as the cubes of their radii; the squares of the velocities are therefore as these radii. It has been shewn, that the central forces of bodies, moving in circular orbits, are as the squares of the velocities, divided by the radii of the circumferences described; the tendency, therefore, of the planets to the sun, is reciprocally as the squares of the radii of their orbits, supposed circular. This hypothesis, it is true, is not rigorously exact; but the constant relation of the squares of the times to the cubes of the greater axes of their orbits being independent of their eccentricities, it is natural to think it would subsist also in the case of the orbits being circular. Thus, the law of gravity towards the sun, varying reciprocally as the square of the distance, is clearly indicated by this relation: analogy would lead us to suppose that this law, which extends from one planet to another, should subsist equally for the same planet at its different distances from the sun; and its elliptic motion confirms this beyond a doubt. To comprehend this, let us attend to this motion, beginning at the departure from its perihelion. Its velocity is then at its maximum, and its tendency to recede from the sun surpassing its gravity towards it, its radius vector augments, and forms an obtuse angle

with the direction of its motion. The force of gravity towards the sun, decomposed according to the direction, continually diminishes the velocity till it arrives at the aphelion; at this point the radius vector becoming perpendicular to the curve, its velocity is a minimum; and its tendency to recede from the sun being less than its gravity towards it; the planet will approach it while describing the second part of its ellipse. In this part, the gravity towards the sun increases its velocity in the same manner as it before decreased it; and the planet will arrive at its perihelion with its primitive velocity, and recommences a new revolution, similar to the first. Now the curvature of the ellipse at the aphelion and perihelion being the same, the radii of curvature are the same, and, consequently, the centrifugal forces of these two points are as the squares of the velocities. The forces described in the same time being equal, the aphelion and perihelion velocities are reciprocally as the corresponding distances of the planet from the sun; the squares of these velocities are therefore reciprocally as the squares of these distances; but at the perihelion and aphelion distances, the centrifugal forces in the oscillatory circumferences are evidently equal to the gravity of the planet toward the sun, which is therefore in the inverse proportion to the squares of these distances. Thus the theorem of Huygens on the centrifugal force were sufficient to demonstrate the tendency of the planets towards the sun: for it is highly probable that this law, which extends from one planet to another, and which is verified in the same planet, at its aphelion and perihelion, extends also to every part of the planetary orbit, and at the same time to every distance from the sun. But to establish it in an incontestible manner, it was requisite to determine the general expression of the force which, directed towards the focus of an ellipse, would oblige the planets to describe that curve. And it was Newton who demonstrated that this force was reciprocally as the square of the radius vector. It was essential also to demonstrate rigorously that the force of gravity towards the sun only varies in one planet from the same force in another, according to their different distances from it.

This great geometrician shewed, that this followed necessarily from the law of the squares of the periodic times being reciprocally as the cubes of the distances; supposing therefore all the planets at rest at the same distance from the sun, and abandoned to their gravity towards its centre, they would descend from the same height in equal times; if this result should also extend to the comets, notwithstanding the greater axes of their orbits are unknown; for we have seen in the second book, that the magnitude of the areas described by their radii vectores, supposes the law of the squares of the periodic times proportional to the cubes of their axes.

A general analysis, which embraces every possible result from a given law, shews us that not only an ellipse, but any other conic section, may be described by virtue of the force which retains the planets in their orbits; a comet may therefore move in an hyperbola, but then it would be only once visible, and after its apparition would recede from the sun of the solar system, to approach other suns, which it would again abandon, thus visiting the different systems that are scattered in the immensity of the heavens. It is probable, considering the infinite variety of nature, that such bodies exist. Their apparition should be a very rare occurrence; the comets we usually observe, are those which, having closed orbits, return, at the end of intervals more or less considerable, into the regions of space that are in the vicinity of the sun. The satellites tend also perpetually to the sun. If the moon was not subject to its action, instead of describing an orbit almost circular round the earth, it would soon aban-

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don it; and if this fatellite, and those of Jupiter, were not solicited towards the sun, according to the same law as the planets, perceptible inequalities would result in their motions which have not been recognized by observation.

The planets, comets, and fatellites are therefore subject to the same law of gravity towards the sun. At the same time that the fatellites move round their planet, the whole system of the planet and its fatellites is carried by a common motion, and retained by the same force, round the sun. Thus the relative motion of the planet and its fatellites is nearly the same as if the planet was at rest, and not acted upon by any external force.

We are thus conducted, without the aid of hypothesis, by a necessary consequence of the laws of the celestial motions, to consider the sun as the centre of a force, which, extending infinitely into space, diminishes as the square of the distance increases, and which attracts all bodies that are within the sphere of its activity. Every one of the laws of Kepler discovers a property of this attractive force. The law of the proportionality of the areas to the times shews us, that it is constantly directed towards the centre of the sun. The elliptic orbits of the planets shew that this force diminishes as the distance increases; finally, the law of the proportionality of the squares of the periodic times to the cubes of the distances demonstrates, that the gravity of all the planets towards the sun is the same at equal distances. This gravity may be called the solar attraction when it is considered as relative to the centre of the sun, towards which it is directed; for without knowing the cause, we may by one of those suppositions, common among geometers, imagine an attractive power residing in the centre of the sun.

The errors to which observations are liable, and the small alterations in the elliptic motions of the planets, leave a little uncertainty in the results deduced from the laws of motion; and it may be doubted if the solar attraction diminishes exactly in the inverse ratio of the square of the distance. But a very small variation in this law would produce a very perceptible difference in the motions of the planetary orbits. The perihelion of the terrestrial orbit would have an annual motion of  $1' 5''$  if we only increased by one ten thousandth part the power of the distance to which the solar orbit is reciprocally proportional; this motion is only  $11''.6$  according to observation, and of this we shall hereafter see the cause. The law of the square of the distance is then, at least, extremely near, and its extreme simplicity should induce us to adopt it, as long as observations do not compel us to abandon it. At the same time we must not measure the simplicity of the laws of nature by our facility of conception, but when those which appear to us the most simple accord perfectly with observations of the phenomena, we are justified in supposing them rigorously exact.

The gravity of the fatellites towards the centre of their planet, is the necessary consequence of the proportionality of the areas described by their radii vectores to the times, and the law of the diminution of this force, according to the square of the distance, is indicated by the ellipticity of their orbits. But this ellipticity is hardly to be perceived in the orbits of the fatellites of Jupiter, Saturn, and Uranus, which renders the law of the diminution of the force difficult to ascertain by the motion of any one single fatellite; but the constant ratio of the squares of the times of their revolutions to the cubes of their distances, indicates it beyond a doubt, by demonstrating, that from one fatellite to another, the gravity towards the planet is reciprocally as the square of the distance from its centre.

This proof is wanting for the earth, it having but one fa-

tellite, but it may be supplied from the following considerations:

The force of gravity extends to the summits of the highest mountains, and the small diminution which it there experiences, leaves no doubt but that this force would be perceptible at much greater altitudes. Is it not natural to extend this to the moon, and to suppose that the force which retains it in its orbit, is its gravity towards the earth, in the same manner as the solar gravity retains the planets in their orbits round the sun? for, in fact, these two forces seem to be of the same nature; they both of them penetrate the most intimate parts of matter, animating them with the same velocities; for we have seen that the solar gravity solicits equally all bodies placed at equal distances from the sun, and that the terrestrial gravity also causes all bodies to fall through the same height in equal times.

A heavy body, projected with force horizontally from a great height, falls on the earth at a considerable distance, describing a curve, which is apparently parabolic; it will fall still further, if the force is greater, and supposing it about seven thousand metres in a second, it would not fall to the earth, but would circulate round it like a fatellite, setting aside the resistance of the air: for it has been fully shewn above, that, to form a moon of this projectile, it must be taken to the height of that body, and there receive the same motion of projection; and the identity of the moon's tendency to the earth, has been already demonstrated, by shewing that to obtain this tendency, it is sufficient to diminish the terrestrial gravity according to the general law of the variation of the attractive force of the celestial bodies: and we have seen, that the law of the diminution of gravity, which in planets, accompanied by several fatellites, is proved by a comparison of their periodic times, with their distances, is demonstrated for the moon, by comparing its motion with that of projectiles, at the surface of the earth.

The observations of the pendulum made at the summits of mountains, had already indicated this diminution of the terrestrial gravity; but they were insufficient to discover the law, because of the small height of the most elevated mountains, compared with the radius of the earth: it was requisite to find a body very remote from us, as the moon, to render the law perceptible, and to convince us, that the force of gravity on the earth is only a particular case of a law that pervades the whole universe.

Every phenomenon throws new light on, and confirms the laws of nature. Thus the comparison of experiments on gravity with the lunar motion shews us, that the origin of the distances of the sun and planets, in the calculation of their attractive forces, should be placed in their centres of gravity; for it is evident, that this takes place on the earth, whose attractive force is of the same nature as that of the sun and planets.

The sun, and those planets which are accompanied by fatellites, being thus proved to be endowed with an attractive force, varying inversely as the square of the distance, a strong analogy leads us to attribute the same property to the other planets. The spherical figure common to all these bodies, indicates that their particles are united round their centres of gravity by a force which, at equal distances, equally solicits them towards these points; but the following considerations leave no doubt upon this subject.

We have seen, that if the planets and comets were placed at the same distance from the sun, their gravity towards it would be in proportion to their masses: now, it is a general law in nature, that action and re-action are equal and contrary; all these bodies, therefore, re-act on the sun, and attract in proportion to their masses: they are therefore endow-  
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dowed with an attractive force proportional to their masses, and varying inversely as the square of the distance. By the same principle, the satellites attract the planets and the sun according to the same law. This attractive property, then, is common to all the celestial bodies: it does not disturb the elliptic motion round the sun, when we consider only their mutual action; for the relative motion of the bodies of a system are not changed by giving them a common velocity: by impressing, therefore, in a contrary direction to the sun and to the planet, the motion of the first of these two bodies, and the action which it experiences on the part of the second, the sun may be considered as immovable, but the planet will be solicited towards it with a force varying reciprocally as the square of the distance, and proportional to the sum of the masses; its motion round the sun will therefore be elliptic. And we see by the same reasoning, that it would be so if the planet and sun were carried through space with a motion common to each of them. It is equally evident that the elliptic motion of a satellite is not disturbed by the motion of translation of its planet, nor would it be by the action of the sun, if it was always exactly the same on the satellite and the planet.

Nevertheless, the action of the planet on the sun influences the length of its revolution, which is diminished as the mass of the planet is more considerable; so that the relation of the square of its periodic time, to the cube of the major axis of its orbit, depends on its mass. But since this relation is nearly the same for all the planets, their masses must evidently be very small compared with that of the sun, which is equally free for the satellites with respect to their principal planets.

This we may readily suppose from their smallness.

The attractive property of the heavenly bodies not only belongs to them in a mass, but to each of their particles. If the sun only acted on the centre of the earth without attracting particularly every one of its particles, oscillations would arise in the ocean, infinitely more considerable and very different from those which we observe. The gravity of the earth to the sun, therefore, is the result of the gravity of all its particles, which consequently attract the sun in proportion to their respective masses; besides, each body on the earth tends towards its centre proportionally to its mass, it reacts therefore on it, and attracts it in the same ratio. If that was not the case, and if any part of the earth, however small, attracted another part without being attracted by it, the centre of gravity would move in space, in virtue of the force of gravity, which is impossible.

The celestial phenomena, compared with the laws of motion, conduct us therefore to this great principle of nature, namely, that all the particles of matter attract each other in proportion to their masses, and inversely as the squares of their distance.

Already we may perceive in this universal gravitation, the cause of the perturbations to which the heavenly bodies are subject; for the planets and comets being subject to the action of each other, they must deviate a little from the laws of the elliptic motion, which they would otherwise exactly follow, if they only obeyed the action of the sun. The satellites also, deranged in their motions round their planets by their mutual action, and that of the sun, deviate a little from these laws.

We perceive then that the particles of the heavenly bodies, united by their attraction, should form a mass nearly spherical; and that the result of their action at the surface of the body should produce all the phenomena of gravitation.

We see moreover that the motion of rotation of the celestial bodies should slightly alter their spherical figure,

and flatten them at the poles; and then the resulting force of all their mutual actions not passing through their centres of gravity, should produce in their axes of rotation similar motions to those discovered by observation. Finally, we may perceive why the particles of the ocean, unequally acted on by the sun and moon, should have oscillations similar to the ebbing and flowing of the tides. But to see different effects of the principle of gravitation must be particularly developed, to give it all the certainty of which physical truth is susceptible.

It is in the universal application of this theory to all the known celestial phenomena, that the modern science of physical astronomy consists, a science which owes its origin to Newton, and which has been cultivated by every eminent mathematician, from the time of that great philosopher to the present day. It is to La Place that the merit must be given of having completed this theory, by shewing that there remains not a single phenomenon that it is not capable of explaining; he justly observes, that there is no question here of vague causes, which cannot be submitted to analysis, and which the imagination modifies at pleasure, to accommodate them to the phenomena. The law of universal gravitation has this inestimable advantage, that it may be reduced to calculation, and by a comparison of its results with observation, it presents the most certain method of verifying its excellence; and so far are we from having to fear that new observations will disprove this theory, we may be assured before hand that they will only confirm it more and more, and that its consequences are equally certain as if they had actually been observed.

The astronomical phenomena produced by the mutual gravitation of the heavenly bodies, will be found in the different parts of this work. As each subject will be particularly treated under its appropriate article, see *Figure of the Earth*; *Precession of the Equinoxes*; *Nutation of the Earth's axis*; *Perturbation of the Planets, Moon, and Satellites*; *TIDES, LIBRATION of the Moon, &c.*

But as the investigation of laws by which particles of matter gravitate to spheres and other solids cannot with propriety be referred to any other article, and as it forms so very essential a part of physical astronomy, we shall enter on the subject very fully. The more simple and easy investigations of astronomy suppose the action to be confined to simple gravitating points; now as no such points exist in nature, it becomes requisite to consider the effect which an assemblage of these points will produce when arranged in different forms. Newton, who first entered upon these speculations, investigated almost all the cases which seem applicable to physical astronomy, but professor Plouffe has lately extended these researches, and has presented a paper on the subject to the Philosophical Society of Edinburgh, which would reflect honour on the first mathematicians of Europe. A few of the leading propositions of this excellent memoir, will follow the investigation of the law of gravitation to a sphere.

Of the gravitation of particles of matter to spheres, and other mathematical figures.

1. *A particle of matter placed within a sphere of uniform density, remains in equilibrio.*

Let  $A, L, B, M$ , a  $l, b, m$ , (Plate XV. *Astronomy*, fig. 124.) be two spherical surfaces, of which  $C$  is the common centre, and let the space between them be filled with gravitating matter, uniformly dense. Let  $p$  be a particle placed any where within this spherical shell, to every particle of which it gravitates with a force inversely as the square of its distance from it. This particle will have no tendency to move in any direction, because

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its gravitation in any one direction is exactly balanced by an equal gravitation in the opposite direction.

Draw through  $p$  the two straight lines  $dp\epsilon$ ,  $ep\delta$ , making a very small angle at  $p$ . This may represent the section of a very slender double cone  $dpc\delta p\epsilon$ , having  $p$  for the common vertex, and  $dc\delta\epsilon$  for the diameter of the circular bases. The gravitation of  $p$  to the matter in the base  $de$  is equal to its gravitation to the matter in the base  $\delta\epsilon$ . For the number of particles in  $de$  is to the number in  $\delta\epsilon$ , as the surface of the base  $de$  to that of the base  $\delta$ , that is, as  $de^2$  to  $\delta^2$ , that is, as  $pd$  to  $p\delta$ , that is, as the gravitation to a particle in  $\delta\epsilon$  to the gravitation to a particle in  $de$ . Therefore the whole gravitation to the matter in  $de$ , is the same with the whole gravitation to the matter in  $\delta\epsilon$ : since it is also in the opposite direction, the particle  $p$  is in equilibrium. The same thing may be demonstrated of the gravitation to the matter in  $qr$  and  $st$ , and in a similar manner, of the gravitation to the matter in the sections of the cones  $dpe$ ,  $\delta p\epsilon$ , by any other concentric surface. Consequently, the gravitation to the whole matter contained in the solid  $dqre$ , is equal to the gravitation to the whole matter in the solid  $\delta t s \epsilon$ , and the particle  $p$  is still in equilibrium.

Now since the lines  $dp$ ,  $ep$ , may be drawn in any direction, and thus be made to occupy the whole sphere, it is evident that the gravitation of  $p$  is balanced in every direction, and therefore it has no tendency to move in any direction, in consequence of this gravitation to the spherical shell of matter comprehended between the surfaces  $ALBM$  and  $albm$ .

It is also evident, that this holds true with respect to all the matter comprehended between  $ALBM$ , and the concentric surface  $pnv$  passing through  $p$ ; in short  $p$  is in equilibrium in its gravitation, to all the matter more remote than itself from the centre of the sphere, and appears as if it did not gravitate at all to any matter more remote from its centre.

We have supposed the spherical shell to be uniformly dense. But  $p$  will still be in equilibrium, although the shell be made up of concentric strata of different densities, provided that each stratum be uniformly dense.

For should we suppose, that in the space comprehended between  $ALBM$  and  $pnv$ , there occurs a surface  $albm$  of a different density from all the rest, the gravitation to the intercepted portions  $qr$  and  $st$  are equal, because those portions are of equal density, and are proportioned to  $p q^2$  and  $p s^2$  inversely. The proposition may therefore be expressed in the following very general terms, "a particle placed any where within a spherical shell of gravitating matter, of equal density, at all equal distances from the centre, will be in equilibrium, and will have no tendency to move in any direction."

The equality of the gravitation to the surface  $ed$ , and to the surface  $\delta\epsilon$  is affirmed, because the numbers of particles in the two surfaces are inversely as the gravitations towards one in each.

For the very same reason, the gravitations towards the surfaces  $ed$  and  $qr$  and  $ts$  are all equal. Hence may be derived an elementary proposition; which is of great use in all enquiries of this kind, namely,

If a cone, or pyramid  $dpe$ , of uniform gravitating matter, be divided by parallel sections  $dc$ ,  $qr$ , &c. the gravitation of a particle  $p$  in the vertex, to each of those sections, is the same, and the gravitations to the solids  $pqr$ ,  $pde$ ,  $qder$ , &c. are proportional to their lengths  $pq$ ,  $pd$ ,  $qd$ , &c. the first part of this proposition is already demonstrated. Now, conceive the cone to be thus divided into innumerable slices of equal thickness: it is plain that the gravitation to each

of these is the same; and, therefore, the gravitation to the solid  $pqr$ , is to the gravitation to the solid  $qder$ , as the number of slices in the first, to the number of slices in the second, that is, as  $pq$ , the length of the first, to  $qd$ , the length of the second. The cone  $dpe$  was supposed extremely slender. This was not necessary for the demonstration of the particular case where all the sections were parallel; but in this elementary proposition, the angle at  $p$  is supposed smaller than any assigned angle, that the cone or pyramid may be considered as one of the elements into which we may resolve a body of any form. In this resolution, the bases are supposed, if not otherwise expressly stated, to be parallel, and perpendicular to the axes; indeed, they are supposed to be portions  $ar$ ,  $ye$ ,  $ze$ , of spherical surfaces, having their centres in  $p$ : the small portions  $xrq$ ,  $yed$ ,  $zed$ , &c. are held as insignificant, vanishing in the ultimate ratios of the whole solids.

It is easy, also, to see that the equilibrium of  $p$  is not limited to the case of a spherical shell, but will hold true of any body composed of parallel strata, or strata so formed, that the lines  $pd$ ,  $p\delta$ , are cut in the same proportion by the sections  $dc$ ,  $qr$ , &c. In a spheroidal shell, for instance, whose inner and outer surfaces are similar, and similarly posited spheroids, the particle  $p$  will be in equilibrium any where within it; because, in this case, the lines  $p\delta$  and  $pe$  are equal; so are the lines  $p\delta$  and  $od$ , the lines  $t\delta$  and  $re$ , the lines  $s\delta$  and  $qd$ , &c.: in most cases, however, there is but one situation of the particle  $p$  that insures this equilibrium. But we may at the same time infer this very useful proposition,

2. *If there be two solids, perfectly similar, and of the same uniform density, the gravitation to each of these solids, by a particle similarly placed on or in each, is proportional to any homologous lines of the solids.*

For, the solids being similar, they may be resolved into the same number of similar pyramids similarly placed in the solids. The gravitations to each of any corresponding pair of pyramids are proportional to the lengths of those pyramids. These lengths have the same proportion in every corresponding pair. Therefore, the absolute gravitations to the whole pyramids of one solid have the same ratio to the absolute gravitation to the whole pyramids of the other solid. And since the solids are similar, and the particles are at the similarly placed vertices of all the similar and similarly placed pyramids, the gravitation compounded of the absolute gravitations to the pyramids of one solid, has the same ratio to the gravitation similarly compounded of the absolute gravitations to the pyramids of the other.

3. *The gravitation of an external particle to a spherical surface, shell, or entire sphere, which is equally dense at all equal distances from the centre, is the same as if the whole matter were condensed in its centre.*

Let  $ALBM$  (fig. 124) represent such a sphere, and let  $P$  be the external particle. Draw  $PACB$  through  $C$ , the centre of the sphere, and cross it by  $LCM$  at right angles. Draw two right lines  $PD$ ,  $PE$ , containing a very small angle at  $P$ , and cutting the great circle  $ALBM$ , in  $D$ ,  $E$ ,  $D'$ ,  $E'$ . About  $P$ , as a centre with the distance  $PC$ , describe the arc  $Cdm$ , cutting  $DP$  in  $d$ , and  $EP$  in  $e$ . About the same centre describe the arc  $DO$ . Draw  $dF$ ,  $eG$ , parallel to  $AB$ , and cutting  $LC$  in  $f$  and  $g$ . Draw  $CK$  perpendicular to  $PD$ , and  $dH$ ,  $D\delta$ , and  $IF\zeta$ , perpendicular to  $AB$ . Join  $CD$  and  $CE$ .

Now, let the figure be supposed to turn round the axis  $PB$ . The semi-circumference  $ALB$  will generate a complete spherical surface; the arc  $Cdm$  will generate another spherical surface, having  $P$  for the centre; the small



arcs DE, *de*, FG, will generate rings, or zones, of those spherical surfaces; DO will also generate a zone of a surface having P for its centre; fg and FI will generate zones of flat circular surfaces.

It is evident that the zones generated by DE and DO, (which we may call the zones DE, DO,) having the same radius  $D\frac{1}{2}$ , are to each other as their respective breadths DE, DO. In like manner, the zones generated by *de*, fg, FI, FG, being all at the same distance from the axis AB, are also as their respective breadths *de*, fg, FI, FG. But the zone DO is to the zone *de*, as PD to P*d*: for DO is to *de*, as PD to P*d*, and the radius of rotation Dδ is to the radius dH, also as PD to P*d*. The circumferences, described by DO and *de*, are, therefore, in the same proportion as PD to P*d*; therefore the zones being as their breadths, and as their circumferences jointly, are as PD and P*d*².

CK and dH, being the sines of the same arc C*d*, are equal; therefore KD and fF, the halves of chords equally distant from the centre, are also equal: therefore the triangles CDK and CFf are equal and similar. But CDK is similar to EDO, for the right angles PDO and CDE are equal. Taking away the common angle CDO, the remainders CDK and EDO are equal. In like manner, CFf and GFI are similar; and, therefore, (since CDK and CFf are similar,) the elementary triangles EDO and GFI are similar, and DO : DE = FI : GF. The absolute gravitation, or tendency of P, to the zone DO, is equal to its absolute gravitation to the zone *de*, because the number of particles in the first, is to the particles in the last, as PD² to P*d*², that is, inversely as the gravitation to a particle in the first, to the gravitation to a particle in the last; therefore let *c* represent the circumference of a circle, whose radius is 1. The surface of the zone generated by DO, will be DO × *c* × Dδ, and the gravitation to it will be  $\frac{DO \times c \times D\delta}{PD^2}$ , to which  $\frac{de \times c \times dH}{P d^2}$ , or

$\frac{de \times c \times dH}{P C^2}$ , is equal. This expresses the absolute gravitation to the zone generated by DO, this gravitation being exerted in the direction PD.

But it is evident that the tendency of P, arising from its gravitation to every particle in the zone, must be in the direction PC. The oblique gravitation must, therefore, be estimated in the direction PC, and must be reduced in the proportion of Pd to PH. It is plain that Pd : PH = *de* : fg, because *de* and fg are perpendicular to Pd and PH; therefore the reduced, or central gravitation of P, to the zone generated by DO, will be expressed by  $\frac{fg \times c \times dH}{P C^2}$ .

But the gravitation to the zone generated by DO, is to the gravitation to the zone generated by DE, as DO to DE, that is, as FI (or fg) to FG. Therefore the central gravitation to the zone generated by DE, will be expressed by  $\frac{FG \times c \times dH}{P C^2}$ . Now, FG × *c* × dH is the value of the surface of the zone generated by FG; and if all this matter were collected in C, the gravitation of P to it would be exactly  $\frac{FG \times c \times dH}{P C}$ , and it would be in the direction PC. Hence it follows, that the central gravitation of P to the zone generated by DE, is the same as its gravitation to all the matter in the zone generated by FG, if that matter were placed in C.

What has been demonstrated respecting the arc DE, is true of every portion of the circumference. Each part, a substitute FG, which being placed in the centre, the gravitation of P is the same. If P T be a part of the arc DE, every portion of the arc T L B will have a substitute in the quadrant L B, and every part of the arc A T L will have a substitute in the quadrant A T L, and so on. And hence it follows, that the gravitation of a particle, P, to a spherical surface, A L B M, is the same as if all the matter of that surface were collected in its centre.

We see also that the gravitation to the surface generated by the rotation of A T round A B is equal to the gravitation to the surface generated by T L B, which is much larger but more remote.

What we have now demonstrated with respect to the surface generated by the semicircle A L B, is equally true with regard to the surface generated by any other arc spherical, such as a l h. It is true, therefore, with respect to the shell comprehended between those two surfaces; for this shell may be resolved into innumerable concentric strata, and the proposition may be affirmed with respect to each of them, and therefore with respect to the whole. And this will be still true if the whole sphere be thus supposed.

Lastly, it follows that the proposition is still true, although these strata should differ in density, provided that each stratum is uniformly dense in every part.

It may, therefore, be affirmed in the most general terms, that a particle, P, placed without a spherical surface, shell, or entire sphere, equally dense at equal distances from the centre, tends to the centre with the same force, as if the whole matter of the surface, shell, or sphere were collected there.

This will be found to be a very important proposition.

4. *The gravitation of an external particle to a spherical surface, shell, or entire sphere, of uniform density at equal distances from the centre, is as the quantity of matter in that body directly; and as the square of the distance from its centre inversely.*

For, if all the matter were collected in its centre, the gravitation would be the same, and it would then vary in the inverse duplicate ratio of the distance.

Cor. 1.—Particles placed on the surfaces of spheres of equal density, gravitate to the centres of those spheres with forces proportional to the radii of the spheres.

For the quantities of matter are as the cubes of the radii.

Therefore the gravitation *g* is as  $\frac{P}{d}$ , that is, as *d*.

Cor. 2.—The same thing holds true if the distance of the external particles from the centres of the spheres be as the diameters or radii of the spheres.

Cor. 3.—If a particle be placed within the surface of a sphere of uniform density, its gravitation at equal distances from the centre will be as those distances. For, it will not be affected by any matter of the sphere that is more remote from the centre, and its gravitation to what is less remote, is as its distance from the centre, by the 1st Cor.

5. *The mutual gravitation of two concentric spheres, or of their concentric strata, is as the square of the distance of their centre to their centre.*

For the gravitation of each particle in the sphere A, is to the sphere B, the same as if all the matter in B were collected at its centre. Suppose it to be so.

The gravitation of B to A will be the same as if all the matter in A were collected at its centre. Therefore it will be as *d*² inversely. But the gravitation of A to B is equal to that of B to A. Therefore, &c.

The absolute gravitation of two spheres whose quantities

of matter are  $A$  and  $B$ , and  $d$  the distance of their centres, is  $\frac{A \times B}{d^2}$ . For the tendency of one particle of  $A$  to  $B$ , being the aggregate of its tendencies to every particle of  $B$ , is  $\frac{B}{d}$ . Therefore, the tendency of the whole of  $A$  to  $B$  must be  $\frac{A \times B}{d}$ . And the tendency of  $B$  to  $A$  is equal to that of  $A$  to  $B$ .

6. But if the centripetal forces which tend to the different points of spheres are proportional to the simple distances from the attracted bodies, then the compounded force with which two spheres attract each other mutually, is as the distance between the centres of the spheres.

Case 1.—Let  $AEBF$  (fig. 125.) be a sphere;  $S$  its centre;  $P$  a particle attracted;  $PASB$  the axis of the sphere passing through the centre of the particle;  $EF, ef$ , two planes cutting the sphere and perpendicular to the axis, and equidistant one on one side, the other on the other, from the centre of the sphere;  $G$  and  $g$  the interfections of the planes and the axis; and  $H$  any point in the plane  $E F$ . The centripetal force of the point  $H$  on the particle  $P$ , exerted in the direction of the line  $PH$ , is as the distance  $PH$ ; and the same exerted in the direction of the line  $PG$ , or towards the centre  $S$ , is as the length  $PG$ . Therefore, the force of all the points in the plane  $E F$ , (that is, of the whole plane) by which the particle  $P$  is attracted towards the centre  $S$ , is as the distance  $PG$  multiplied by the number of those points, that is, as the solid contained under that plane  $E F$ , and the distance  $PG$ . And, in like manner, the force of the plane  $ef$ , by which the particle  $P$  is attracted towards the centre  $S$ , is as that plane multiplied into its distance  $Pg$ ; or as the equal plane  $E F$  multiplied into that distance  $Pg$ ; and the sum of the forces of both planes is as the plane  $E F$ , multiplied into the sum of the distances  $PG + Pg$ , that is, as that plane multiplied into twice the distance  $PS$  of the centre and the particle; that is, as twice the plane  $E F$ , multiplied into the distance  $PS$ , or as the sum of the equal planes  $E F + ef$  multiplied into the same distance. And by a similar train of reasoning, the forces of all the planes in the whole sphere, equidistant on each side from the centre of the sphere, are as the sum of those planes, multiplied into the distance  $PS$ , that is, as the whole sphere, and the distance  $PS$  jointly.

Case 2.—Let the particle  $P$  now attract the sphere  $AEBF$ , and, by the same reasoning, it will appear that the force with which the sphere is attracted is as the distance  $PS$ .

Case 3.—If another sphere be now composed of innumerable particles  $P$ , and because the force with which every particle is attracted is as the distance of the particle from the centre of the first sphere, and as the same sphere conjointly, and is therefore the same as if the whole proceeded from a single particle situated in the centre of the sphere; the entire force with which all the particles in the second sphere are attracted, that is, with which the whole sphere is attracted, will be the same as if that sphere were attracted by a force proceeding from a single particle in the centre of the first sphere, and is therefore proportional to the distance between the centres of the spheres.

Case 4.—Let the spheres attract each other mutually, and the force will be doubled, but the proportion will remain the same.

Case 5.—Let the particle  $P$  be placed within the sphere  $AEBF$ , (fig. 126.) and because the force of the plane  $ef$ , upon the particle, is as the solid contained under that plane

and the distance  $pg$ ; and the contrary force of the plane  $E F$ , is as the solid contained under that plane and the distance  $pG$ ; the force compounded of both will be as the difference of the solids, that is, as the sum of the equal planes multiplied into half the difference of the distances; that is, as that sum multiplied into  $pS$ , the distance of the particle from the centre of the sphere. And, by a similar train of reasoning, the attraction of all the planes  $E F, ef$ , throughout the sphere, that is, the attraction of the whole sphere is conjointly as the sum of all the planes or as the whole sphere, and as  $pS$  the distance of the particle from the centre of the sphere.

Case 6.—And if a new sphere be now composed of innumerable particles, such as  $p$ , situated within the first sphere  $AEBF$ , it may be proved, as before, that the attraction, whether single of one sphere towards the other, or mutual of both towards each other, will be as the distance  $pS$  of the centres.

7. If the structure of the spheres be dissimilar and unequal, proceeding directly from the centre towards the circumference, but similar and equal throughout every circumference, at equal distances from the centre, and if the attractive force be as the distance of the attracted body, then the entire force with which two spheres of this kind attract each other mutually is proportional to the distance between the centres of the spheres.—This is demonstrated from the preceding proposition.

The above investigations relate to the principal cases of attraction, namely, when the centripetal forces decrease in a duplicate ratio, or increase in the simple ratio of the distance. And it is remarkable that both these suppositions cause bodies to revolve in conic sections, and compose spherical bodies, whose centripetal forces observe the same law of increase or decrease, in the recess from the centre, as the forces of the particles themselves do.

8. If a circle  $AEB$  (fig. 127.) be described round the centre  $S$ , and two circles  $EF, ef$ , be also described round the centre  $P$ , intersecting the former in  $E$  and  $e$ , and the line  $PS$  in  $F$  and  $f$ ; and if  $ED, ed$ , be drawn perpendicular to  $PS$ ; then if the distance of the arcs  $EF, ef$ , be supposed to be infinitely diminished, the limiting ratio of the evanescent line  $Dd$  to the evanescent line  $Ff$  is the same as that of the line  $PE$  to the line  $PS$ .

For if the line  $Pe$  intersect the arc  $EF$  in  $q$ , and the right line  $Ee$ , which coincides with the evanescent arc  $Ee$ , be produced and meet the right line  $PS$  in  $T$ ; and the perpendicular  $SG$  be drawn from  $S$  to  $PE$ , because the triangles  $DTE, dTe, DES$ , are similar,  $Dd$  will be to  $Ee$  as  $DT$  to  $TE$ , or  $DS$  to  $ES$ ; and because the triangles  $Eeq, ESG$ , are similar,  $Ee$  will be to  $eq$  or  $Ff$  as  $ES$  to  $SG$ ; and ex aequo  $Dd$  is to  $Ff$  as  $DE$  to  $SG$ ; that is, (because the triangles  $PDE, PGS$ , are similar,) as  $PE$  to  $PS$ .

9. If a superficies, as  $EFfe$  (fig. 128.) be supposed to have its breadth infinitely diminished, and that by its revolution round the axis  $PS$  it describes a spherical concavo-convex solid to the several equal particles of which equal centripetal forces tend: then the force with which that solid attracts a particle placed at  $P$  is in a ratio compounded of the ratio of the solid  $DE^2 \times Ff$ , and the ratio of the force with which the given particle in the place  $Ff$  would attract the same particle.

For if the force be first considered of the spherical superficies  $FE$ , which is generated by the revolution of the arc  $FE$ , and is intersected any where, as in  $r$ , by the line  $de$ , the annular part of the superficies generated by the revolution

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revolution of the arc  $rE$  will be as the small line  $Dd$ , the radius of the sphere remaining the same; as Archimedes has demonstrated in his book on the sphere and cylinder. And the force of these superficies exerted in the direction of the lines  $PE$  or  $Pf$  situated all round in the conical superficies, will be as this annular superficies itself; that is, as the line  $Dd$ , or, which is the same, as the rectangle under the given radius  $PE$  of the sphere, and the line  $Dd$ ; but that force, exerted in the direction of the line  $PS$ , tending to the centre  $S$ , will be less in the ratio of  $PD$  to  $PE$ , and therefore will be as  $PD \times Dd$ . If the line  $DF$  be now considered as divided into innumerable equal particles, each of which may be called  $Dd$ , then the superficies  $FE$  will be divided into so many equal annuli, whose forces will be as the sum of all the rectangles  $PD \times Dd$ ; that is, as  $\frac{1}{2} PF^2 - \frac{1}{2} PD^2$  and therefore as  $DE^2$ . Let now the superficies  $FE$  be multiplied into the altitude  $Ff$ , and the force of the solid  $EFfe$  exerted upon the particle  $P$  will be as  $DE^2 \times Ff$ ; that is, if the force be given which any given particle, as  $Ff$ , exerts upon the particle  $P$  at the distance  $PF$ . But if that force be not given, the force of the solid  $EFfe$  will be as the solid  $DE^2 \times Ff$ , and that force not given conjointly.

10. *If to the several equal parts of a sphere  $ABE$  fig. 129.) described about the centre  $S$ , there tend equal centripetal forces; and if from the several points  $D$ , perpendiculars  $D, E$ , be drawn to the axis of the sphere  $AB$ , in which a particle  $P$  is placed, meeting the sphere in  $E$ ; and if in these perpendiculars the lengths  $D, N$ , be taken as the quantity  $\frac{DE^2 \times PS}{PE}$ , and as the force which a particle of the sphere situated in the axis exerts at the distance  $PE$  upon the particle  $P$  conjointly; then the whole force with which the particle  $P$  is attracted towards the sphere is as the area  $ANB$ , comprehended under the axis of the sphere  $AB$ , and the curve line  $ANB$ , the locus of the point  $N$ .*

For supposing the construction in the last lemma and theorem to remain, let the axis of the sphere  $AB$  be supposed to be divided into innumerable equal particles  $D, d$ , and the whole sphere to be divided into so many spherical concavo-convex laminæ  $EFfe$ , and let the perpendicular  $dn$  be drawn. By the last theorem the force with which the laminæ  $EFfe$ , attracts the particle  $P$ , is as  $DE^2 \times Ff$ , and the force of one particle exerted at the distance  $PE$  or  $Pf$  conjointly. But (by the last lemma)  $Dd$  is to  $Ff$  as  $PE$  to  $P'S$ , and therefore  $Ff$  is equal to  $\frac{PS \times Dd}{PE}$ ; and  $DE^2 \times Ff$  is equal to  $Dd \times \frac{DE^2 \times PS}{PE}$ ; and therefore the force of the laminæ  $EFfe$ , is as  $Dd \times \frac{DE^2 \times PS}{PE}$ , and the force of a particle exerted at the distance  $PF$  conjointly; that is, by the supposition, as  $DN \times Dd$ , or as the evanescent area  $DNnd$ . Therefore the forces of all the laminæ exerted upon the particle  $P$  are as the areas  $DNnd$ , that is, the sphere will be as the whole area  $ANB$ .

*Cor. 1.*—Hence if the centripetal force tending to the several particles remain always the same at all distances, and  $DN$  be made as  $\frac{DE^2 \times PS}{PE}$ , the whole force with which the particle is attracted by the sphere is as the area  $ANB$ .

*Cor. 2.*—If the centripetal force of the particles vary reciprocally as the distance of the particle attracted by it, and

$DN$  be made as  $\frac{DE^2 \times PS}{PE^2}$ , the force with which the particle  $P$  is attracted by the whole sphere will be as the area  $ANB$ .

*Cor. 3.*—If the centripetal force of the particles vary reciprocally as the cube of the distance of the particle attracted by it, and  $DN$  be made as  $\frac{DE \times PS}{PE^2}$ , the force with which the particle is attracted by the whole sphere will be as the area  $ANB$ .

*Cor. 4.*—And universally of the centripetal force tending to the several particles of the sphere be supposed to be reciprocally as the quantity  $V$ ; and  $DN$  be made as  $\frac{DE^2 \times PS}{PE \times V}$ , the force with which a particle is attracted by the whole sphere will be as the area  $ANB$ .

11. *Supposing every thing to remain as above, it is required to measure the area  $ANB$  fig. 130.*

From the point  $P$  let the right line  $PH$  be drawn touching the sphere in  $H$ ; and having drawn  $HI$  perpendicular to the axis  $PAB$ , bisect  $PI$  in  $L$ , and  $PE$  will be equal to  $PS^2 \times SE^2 \times 2PSD$ . But because the triangles  $SPH, SHI$ , are similar,  $SE^2$  or  $SH^2$  is equal to the rectangle  $PSI$ . Therefore  $PE$  is equal to the rectangle contained under  $PS$  and  $PS \times SI \times 2SD$ ; that is, under  $PS$  and  $2LS \times 2SD$ ; that is, under  $PS$  and  $2LD$ . Moreover  $DE^2$  is equal to  $SE^2 - SD^2$ , or  $SE^2 - LS^2 + 2SLD - LD^2$ , that is,  $2SLD - LD^2 - ALB$ . For  $LS^2 - SE^2$ , or  $LS^2 - SA^2$ , is equal to the rectangle  $ALB$ . Therefore if instead of  $DE^2$  we write  $2SLD - LD^2 - ALB$ , the quantity  $\frac{DE^2 \times PS}{PE \times V}$ , which is as the length of the ordinate  $DN$ ,

will now resolve itself into three parts,  $\frac{2SLD \times PS}{PE \times V}$

$-\frac{LD^2 \times PS}{PE \times V} - \frac{ALB \times PS}{PE \times V}$ ; where, if instead of  $V$

we write the inverse ratio of the centripetal force, and instead of  $PE$ , the mean proportional between  $PS$  and  $2LD$ , those parts will become the ordinates of so many curve lines, whose areas may be found by the common methods.

*Ex. 1.*—If the centripetal force tending to the several particles of the sphere be reciprocally as the distance, instead of  $V$  write  $PE$  the distance, then  $2PS \times LD$  for  $PE^2$ ; and  $DN$  will become as  $SL - \frac{1}{2}LD - \frac{ALB}{2LD}$ .

Suppose  $DN$  equal to the double  $2SL - LD - \frac{ALB}{LD}$

and  $2SL$  the given part of the ordinate drawn in to this length  $AB$  will describe the rectangular area  $2SL \times AB$ ; and the indefinite part  $LD$  drawn perpendicularly in the same length with a continued motion, according to each law that its motion in either direction may, by increasing or diminishing, remain always equal to the length  $LD$ , will describe

the area  $\frac{LB^2 - LA^2}{2}$ , that is the area  $SL \times AP$ ;

which taken from the former area  $2SL \times AB$ , leaves the area  $SL \times AB$ . But the third part  $\frac{ALB}{LD}$ , drawn in

a similar manner with a continued motion perpendicularly into the same length, will describe the area of a hyperbola, which subtracted from the area  $SL \times AB$  will leave  $ANB$  the area sought. Whence the construction of the problem arises. At the points  $L, A, B$  fig. 131. erect

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the perpendiculars  $Ll, Aa, Bb$ ; making  $Aa$  equal to  $Lb$ , and  $Bb$  equal  $Ll$ . Making  $Ll$  and  $Lb$  asymptotes, describe through the points  $a, b$ , the hyperbolic curve  $ab$ ; and the chord  $ba$  being drawn, will enclose the area  $aba$  equal to the area required  $ANB$ .

*Example 2.*—If the centripetal force tending to the several particles of the sphere be reciprocally as the cube of the distance, or, (which is the same thing,) as that cube applied to any given plane; substitute  $\frac{PE^3}{2AS^2}$  for  $V$ , and  $2PS \times LD$  for  $PE^2$ ; and  $DN$  will become as  $\frac{SL \times AS^2}{PS \times LD} - \frac{AS^2}{2PS} - \frac{ALB \times AS^2}{2PS \times LD^2}$ ; that is, (because

$PS, AS, SI$ , are continually proportional,) as  $\frac{LSI}{LD} - \frac{1}{2}SI - \frac{ALB \times SI}{2LD^2}$ . If these three parts be then drawn

into the length  $AB$ , the first,  $\frac{LSI}{LD}$ , will generate the area of an hyperbola; the second,  $\frac{1}{2}SI$ , the area  $\frac{1}{2}AB \times SI$ ; the third,  $\frac{ALB \times SI}{2LD^2}$ , the area  $\frac{ALB \times SI}{2LA} -$

$\frac{ALB \times SI}{2LB}$ , that is,  $\frac{1}{2}AB \times SI$ : from the first subtract the sum of the second and third, and there will remain  $ANB$ , the area sought. Whence arises this construction of the problem. At the points  $L, A, S, B$ , (*fig. 132.*) erect the perpendiculars  $Ll, Aa, Ss, Bb$ , of which suppose  $Ss$  equal  $SI$ ; and through the point  $s$ , to the asymptotes  $Ll, LB$ , describe the hyperbola  $asb$ , meeting the perpendiculars  $Aa, Bb$ , in  $a$  and  $b$ , and the rectangle  $2ASl$ , subtracted from the hyperbolic area  $AasbB$ , will leave  $ANB$ , the area required.

*Example 3.*—If the centripetal force, tending to the several particles of the sphere, decrease in a quadruplicate ratio of the distance from the particles, substitute  $\frac{PE^4}{2AS^3}$  for  $V$ , then  $\sqrt{2PS + LD}$  for  $PE$ , and  $DN$  will become as  $\frac{SI^2 \times SL}{\sqrt{2SI}} \times \frac{1}{\sqrt{LD^3}} - \frac{SI^2}{2\sqrt{2SI}} \times \frac{1}{\sqrt{LD}} -$

$\frac{SI^2 \times ALB}{2\sqrt{2SI}} \times \frac{1}{\sqrt{LD^3}}$ . These three parts, drawn into the length  $AB$ , produce as many areas, namely,  $\frac{2SI \times SL}{\sqrt{2SI}}$

into  $\frac{1}{\sqrt{LA}} - \frac{1}{\sqrt{LB}}, \frac{SI^2}{\sqrt{2SI}}$  into  $\sqrt{LB} - \sqrt{LA}$ ,

and  $\frac{SI^2 \times ALB}{3\sqrt{2SI}}$  into  $\frac{1}{\sqrt{LA^3}} - \frac{1}{\sqrt{LB^3}}$ ; and these,

after the proper reduction, become  $\frac{2SI^2 \times SL}{LI}, SI^2$ , and

$SI^2 + \frac{2SI^3}{3LI}$ : and these, by subtracting the latter terms

from the former, become  $\frac{4SI^3}{3LI}$ ; therefore the entire force

with which the particle  $P$  is attracted towards the centre of the sphere, is as  $\frac{SI^3}{PI}$ , that is, reciprocally as  $PS^3 \times PL$ .

The attraction of a particle, situated within the sphere,

may be determined by the same method; but more expeditiously by the following theorem.

12. If  $SI, SA, SP$ , (*fig. 133.*) be taken continually proportional, in a sphere described round the centre  $S$ , with the radius  $SA$ ; then the attraction of a particle within the sphere, in any place  $I$ , is to its attraction, without the sphere, in a place  $P$ , in a ratio compounded of the sub-duplicate ratio of  $IS, PS$ , the distances from the centre, and the sub-duplicate ratio of the centripetal forces tending to the centre in those places,  $P$  and  $I$ .

As, if the centripetal forces of the particles of the sphere be reciprocally as the distances of the particle attracted by them, the force with which the particle situated at  $I$  is attracted by the entire sphere, will be to the force with which it is attracted at  $P$ , in a ratio compounded of the sub-duplicate ratio of the distance  $SI$  to the distance  $SP$ , and the sub-duplicate ratio of the centripetal force in the place  $I$ , arising from any particle in the centre to the centripetal force in the place  $P$ , arising from the same particle in the centre; that is, in the sub-duplicate ratio of the distances  $SI, SP$ , to each other reciprocally. These two sub-duplicate ratios compose the ratio of equality; and, therefore, the attractions in  $I$  and  $P$ , produced by the whole sphere, are equal. By a similar calculation, if the forces of the particles of the sphere are reciprocally in a duplicate ratio of the distance, it will be found that the attraction in  $I$  is to the attraction in  $P$ , as the distance  $SP$  to the semi-diameter  $SA$  of the sphere. If those forces are reciprocally in a triplicate ratio of the distances, the attractions in  $I$  and  $P$  will be to each other as  $SP^2$  to  $SA^2$ ; if in a quadruplicate ratio, as  $SP^3$  to  $SA^3$ . Therefore, since the attraction in  $P$ , in this last case, was found to be reciprocally as  $PS^2 \times PI$ , the attraction in  $I$  will be reciprocally as  $SA^3$  into  $PI$ ; that is, because  $SA^3$  is given reciprocally as  $PI$ ; and the progression is the same indefinitely. The demonstration of this theorem is as follows:

Retaining the same construction as above, and a particle being in any place  $P$ , the ordinate  $DN$  was found to be as  $\frac{DE^4 \times PS}{PE \times V}$ ; therefore, if  $IE$  be drawn, that ordinate

for any other place of the particle, as  $I$ , will become (substituting  $PS$  and  $PE$  for  $IS$  and  $IE$ ) as  $\frac{DE^4 \times IS}{IE \times V}$ .

Suppose the centripetal forces proceeding from any point of the sphere, as  $E$ , to be to each other at the distances  $IE$  and  $PE$ , as  $PE^n$  to  $IE^n$  (where the number  $n$  denotes the index of the powers of  $PE$  and  $IE$ ), and those ordinates will become as

$\frac{PE^2 \times PS}{PE \times PE^n}$ , and  $\frac{PE^2 \times IS}{IE \times IE^n}$ , whose ratio to each other is

as  $PS \times IE \times IE^n$  to  $IS \times PE \times PE^n$ . Because  $SI, SE, SP$ , are continually proportional, the triangles  $SPE, SEI$ , are alike; and thence  $IE$  is to  $PE$ , as  $IS$  to  $SE$ , or  $SA$ . Substitute the ratio of  $IS$  to  $SA$  for the ratio of  $IE$  to  $PE$ , and the ratio of the ordinates becomes that of  $PS \times IE^n$  to  $SA \times PE^n$ . But the ratio of  $PS$  to  $SA$  is sub-duplicate of that of the distances  $PS, SI$ ; and the ratio of  $IE^n$  to  $PE^n$ , (because  $IE$  is to  $PE$  as  $IS$  to  $SA$ ) is sub-duplicate of that of the forces at the distances  $PS, IS$ ; therefore the ordinates, and consequently the areas which the ordinates describe, and the attractions proportional to them, are in a ratio compounded of those sub-duplicate ratios.

13. To find the force with which a particle, placed in the centre

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*centre of a sphere, is attracted towards any segment of that sphere.*

Let P (fig. 134.) be a particle in the centre of a sphere, and R B S D a segment thereof contained between the plane R D S, and spherical superficies R B S. Let D B be intersected in F by a spherical superficies E F G, described from the centre P, and let the segment be divided into the parts B R E F G S, F E D G: let that surface be supposed not purely mathematical, but physical, having some but a very inconsiderable thickness: let that thickness be called O, and (by what Archimedes has demonstrated) that superficies will be as  $P F \times D F \times O$ : let us suppose besides, the attractive forces of the particles of the sphere, to be reciprocally as that power of the distances of which  $n$  is the index; and the force with which the surface

E F G attracts the body P will be as  $\frac{D E^2 \times O}{P F^n}$ ; that is, as  $\frac{2 D E \times O}{P F^{n-1}} - \frac{D F^2 \times O}{P F^n}$ . Let the perpendicular F N,

drawn into O, be proportional to this quantity, and the curvilinear area D B I, which the ordinate F N, drawn through the length D B, with a continued motion describes, will be as the whole force with which the whole segment R B S D attracts the body P.

14. *To find the force with which a particle, placed without the centre of a sphere, in the axis of any segment, is attracted by that segment.*

Let the body P, placed in the axis A D B, of the segment E B K (fig. 135.) be attracted by that segment: round the centre P, with the radius P E, let the spherical surface E F K be described; and let it divide the segment into two parts E B K F E and E F K D E. Let the force of the former part be found by Prop. 11. and, the force of the latter part by Prop. 13. and the sum of the forces will be the force of the whole segment E B K D E.

These are the principal propositions by which Newton has investigated the nature of the attraction exercised by spherical bodies. In the thirteenth section of the Principia, the author shews the manner in which the law of attraction is investigated for other bodies; the most interesting results are contained in the following propositions.

*Of the attractive forces of bodies which are not of a spherical figure.*

15. *If a body be attracted by another, and its attraction be considerably stronger when it is contiguous to the attracting body, than when they are separated from one another by a very small interval; the forces of the particles of the attracting body decrease, as the attracted body recedes, in more than a duplicate ratio of the particles attracted.*

16. *If the forces of the particles, of which an attractive body is composed, decrease as the attracted body recedes, in a triplicate, or more than triplicate ratio of the distance from the particles, the attraction will be considerably stronger in the place of contact, than when the attracting and attracted bodies are separated from each, though by the most minute interval.*

17. *If two bodies, similar to each other, and consisting of matter equally attractive, attract separately two particles, proportional to those bodies, and in a similar situation to them; the accelerative attractions of the particles towards the entire bodies will be as the accelerative attractions of the particles towards particles of the bodies proportional to the whole, and similarly situated in them.*

18. *If the attractive forces of the equal particles of any body be as the distance of the places from the particles, the force of the whole body will tend to its centre of gravity; and will be*

*the same with the force of a globe, consisting of similar and equal matter, and having its centre in the centre of gravity.*

19. *If there be several bodies, consisting of equal particles, whose forces are as the distances of the particles from each, the force compounded of all the forces by which any particle is attracted, will tend to the common centre of gravity of the attracting bodies; and will be the same as if these attracting bodies, preserving their common centre of gravity, should unite there, and be formed into a globe.*

20. *If a solid be plane on one side, and infinitely extended on all other sides, and consist of equal particles equally attractive, whose forces decrease, as they recede from the plane in the ratio of any power greater than the square of the distances; and a particle placed towards either part of the plane is attracted by the force of the whole solid; then the attractive force of the whole solid, as it recedes from its plane superficies, will decrease in the ratio of a power whose side is the square of a particle from the plane, and is indeed less by three than the index of the power of the distances.*

Though the above propositions are sufficient for all astronomical investigations, yet there are many questions in natural philosophy, particularly those which relate to the attraction of mountains, which require that these enquiries should be extended to a greater variety of cases; and the following propositions form a part of the interesting investigations of professor Playfair, as he has communicated them to the public, in the sixth volume of the Edinburgh Transactions, as above-mentioned: they were suggested to the learned author by the experiments which have been made of late years, concerning the gravitation of terrestrial bodies, particularly by Dr. Maskelyne on the attraction of mountains, and by Mr. Cavendish, on the attraction of leaden balls, as has been described at length under the article DENSITY, to which the reader is referred.

1. *To find the solid into which a mass of homogeneous matter must be formed, to attract a particle given in position with the greatest force possible in a given direction.*

Let A (fig. 136.) be the particle given in position, A B the direction in which it is to be attracted; and A C B H a section of the solid required, by a plane passing through A B.

Since the attraction of the solid is a maximum by hypothesis, any small variation in the figure of the solid, provided the quantity of matter remain the same, will not change the attraction in the direction A B. If, therefore, a small portion of matter be taken from any point C in the superficies of the solid, and placed at D, another point in the same superficies, there will be no variation in the force which the solid exerts on the particle A in the direction A B.

The curve A C B, therefore, is the locus of all the points, in which a body, being placed, will attract the particle A in the direction A B, with the same force. This condition is sufficient to determine the nature of the curve A B C. From C any point in that curve, draw C E perpendicular to A B; then if a mass of matter, placed at C be called  $m^3$ ,  $\frac{m^3}{A C^2}$  will be the attraction of that mass on A, in the direction A C, and  $\frac{m^3 \times A E}{A C^3}$  will be its attraction in the direction A B: as this is constant, it will be equal to  $\frac{m^3}{A B^2}$ , and, therefore,  $A B^2 \times A E = A C^3$ .

All the sections of the required solid, therefore, by planes passing through A B, have this property, that  $A C^3 = A B^2 \times A E$ .

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$= AB^2 \times AE$ ; and as this equation is sufficient to determine the nature of the curve to which it belongs, therefore all the sections of the solid, by planes that pass through  $AB$ , are similar and equal curves; and the solid, in consequence, may be conceived to be generated by the revolution of  $ACB$ , any one of those curves, about  $AB$  as an axis.

The solid so generated may be called the *solid of greatest attraction*, and the line  $ACB$  the *curve of equal attraction*.

II. To find the equation between the co-ordinates of  $ACB$ , the curve of equal attraction.

From  $C$  (*fig.* 136.) draw  $CE$  perpendicular to  $AB$ ; let  $AB = a$ ,  $AE = x$ ,  $EC = y$ .

It has been found that  $AB^2 \times AE = AC^3$ , that is  $a^2 x = (x^2 + y^2)^{3/2}$ , or  $a^2 x^2 = (x^2 + y^2)^3$ , which is an equation to a line of the sixth order.

To obtain  $y$  in terms of  $x$ ,  $x^2 + y^2 = a^2 x^2$ ,  $y^2 = a^2 x^2 - x^2$  and  $y = x \sqrt{a^2 - x^2}$ .

Hence  $y = 0$ , both when  $x = 0$ , and when  $x = a$ . Also, if  $x$  be supposed greater than  $a$ ,  $y$  is impossible. No part of the curve, therefore, lies beyond  $B$ .

The parts of the curve on opposite sides of the line  $AB$  are similar and equal, because the positive and negative values of  $y$  are equal. There is also another part of the curve on the side of  $A$ , opposite to  $B$ , similar and equal to  $ACB$ ; for the values of  $y$  are the same, whether  $x$  be positive or negative.

III. The curve may be easily constructed without having recourse to the value of  $y$  just obtained.

Let  $AB = a$  (*fig.* 136)  $AC = z$ , and the angle  $BAC = \phi$ . Then  $AE = AC \times \cos \phi = z \cos \phi$ , and so  $x^2 \cos \phi = z^2$ , or  $a^2 \cos \phi = z^2$ ; hence  $z = a \sqrt{\cos \phi}$ .

From this formula a value of  $AC$  or  $z$  may be found, if  $\phi$  or the angle  $BAC$  be given; and if it be required to find  $z$  in numbers, it may be conveniently calculated from this expression. A geometrical construction may also be easily derived from it. For if with the radius  $AB$ , a circle  $BFH$  be described from the centre  $A$ ; if  $AC$  be produced to meet the circumference in  $F$ , and if  $FG$  be drawn at right angles to  $AB$ , then  $\frac{AG}{AB} = \cos \phi$ , and so  $z = a \times$

$$\sqrt{\frac{AG}{AB}} = \sqrt{AB \times AG} = AC.$$

Therefore, if from the centre  $A$ , with the distance  $AB$ , a circle  $BFH$  be described; and if a circle be also described on the diameter  $AB$  as  $AKB$ , then drawing any line  $AF$  from  $A$ , meeting the circle  $BFH$  in  $F$ , and from  $F$  letting fall  $FG$  the perpendicular on  $AB$ , intersecting the semicircle  $AKB$  in  $K$ ; and if  $AK$  be joined, and  $AC$  made equal to  $AK$ , the point  $C$  is in the curve.

For  $AK = \sqrt{AB \times AG}$ , from the nature of the semi-circle, and therefore  $AC = \sqrt{AB \times AG}$ , which has been shown to be a property of the curve. In this way a number of points of the curve may be determined; and the *solid of greatest attraction* will be described, as already explained, by the revolution of this curve about the axis  $AB$ .

IV. To find the area of the curve  $ACB$ .

1. Let  $ACE$ ,  $AFG$  (*fig.* 137.) be two radii indefinitely near to one another, meeting the curve  $ACB$  in  $C$  and  $F$ , and the circle described with the radius  $AB$  in  $E$  and  $G$ . Let  $AC = z$  as before, the angle  $BAC = \phi$ , and  $AB = a$ . Then  $GE = a \phi$ , and the area  $AGE = \frac{1}{2}$

$a^2 \phi$ , and since  $AE^2 : AC^2 :: \text{sect. } AEG : \text{sect. } ACF$ , the sector  $ACF = \frac{1}{2} z^2 \phi$ . But  $z^2 = a^2 \cos \phi$ , whence the sector  $ACF = \frac{1}{2} a^2 \phi$ . But  $z^2 = a^2 \cos \phi$ , (III.) whence the sector  $ACF$ , or the fluxion of the area  $ABC = \frac{1}{2} a^2 \phi \cos \phi$ , and consequently the area  $ABC = \frac{1}{2} a^2 \sin \phi$ , to which no constant quantity need be added, because it vanishes when  $\phi = 0$ , or when the area  $ABC$  vanishes.

The whole area of the curve therefore is  $\frac{1}{2} a^2$ , or  $\frac{1}{2} AB^2$ ; for when  $\phi$  is a right angle  $\sin \phi = 1$ . Hence the area of the curve on both sides of  $AB$  is equal to the square of  $AB$ .

2. The value of  $x$ , when  $y$  is a maximum, is easily found. For when  $y$ , and therefore  $y^2$ , is a maximum,  $\frac{y^2}{x} - x^2 = 2x$ , or  $3x^2 = a^2$ , that is,  $x = \frac{a}{\sqrt{3}} = \frac{a}{\sqrt{27}}$ .

Hence calling  $b$  the value of  $y$  when  $a$  maximum,  $b^2 = a^2 \times \frac{a^2}{27} - \frac{a^2}{27} = a^2 \left( \frac{27^2 - 1}{27^2} \right) = \frac{2a^2}{\sqrt{27}}$ , and so  $b = a \frac{\sqrt{2}}{\sqrt[4]{27}}$ , and therefore  $a : b :: \sqrt[4]{27} : \sqrt{2}$ , or as 11 : 7 nearly.

3. It is material to observe, that the radius of curvature  $A$  is infinite: for since  $y^2 = a^2 x^2 - x^2$ ,  $\frac{y^2}{x} = \frac{a^2}{x} - x$ .

But when  $x$  is very small, or  $y$  indefinitely near to  $A$ ,  $\frac{y^2}{x}$  becomes the diameter of the circle, having the same curvature with  $ACB$  at  $A$ ; and when  $x$  vanishes, this value of  $\frac{y^2}{x}$ , or  $\frac{a^2}{x} - x$  becomes infinite, because of the divisor  $x^2$  being in that case  $= 0$ .

The diameter, therefore, and the radius of curvature at  $A$ , are infinite. In other words, no circle, having its centre in  $AB$  produced, and passing through  $A$ , can be described with so great a radius, but that at the point  $A$  it will be within the curve of equal attraction.

The solid of greatest attraction then, at the extremity of its axis, where the attracted particle is placed, is exceedingly flat, approaching more nearly to a plane than the superficies of any sphere can do, however great its radius.

4. To find the radius of curvature at  $B$ , the other extremity of the axis, since  $y^2 = a^2 x^2 - x^2$ , if we divide by  $a - x$ , we have  $\frac{y^2}{a - x} = \frac{a^2 x^2 - x^2}{a - x}$ .

But at  $B$ , when  $a - x$ , or the abscissa reckoned from  $B$  vanishes,  $\frac{y^2}{a - x}$  is the diameter of the circle, having the same curvature with  $ACB$  in  $B$ . But when  $a - x = 0$ , or  $a = x$  both the numerator and denominator of the fraction  $\frac{a^2 x^2 - x^2}{a - x}$  vanishes, so that its ultimate value does not appear.

To remove this difficulty, let  $a - x = z$ , or  $x = a - z$ , then we have  $y^2 = (a - z)^2 - (a - z)^2$ .

But when  $z$  is extremely small, its powers higher than the first may be rejected; and therefore  $(a - z)^2 = a^2 \left( 1 - \frac{z}{a} \right)^2$

$= a^2 \left( 1 - \frac{2z}{a} \right)$ . Therefore the equation to the curve becomes in this case,  $y^2 = a^2 \times a^2 \left( 1 - \frac{2z}{a} \right) - a^2 + 2az = a^2 - \frac{2}{3} az - a^2 + 2az = \frac{4}{3} az$ .

Hence



Hence  $\frac{y^2}{2}$ , or the radius of curvature at  $B = \frac{2}{3} a$ . The curve therefore at  $B$  falls wholly without the circle  $BKA$ , described on the diameter  $AB$ , as its radius of curvature is greater. This is also evident from the construction.

V. To find the force with which the solid above defined attracts the particle  $A$  in the direction  $AB$ .

Let  $B$  (fig. 137), be a point indefinitely near to  $B$ , and let the curve  $Acb$  be described similar to  $ACB$ ; through  $C$  draw  $CcD$  perpendicular to  $AB$ , and suppose the figure thus constructed to revolve about  $AB$ ; then each of the curves  $ACB$ ,  $Acb$ , will generate a solid of greatest attraction; and the excess of the one of these solids above the other, will be an indefinitely thin shell, the attraction of which is the variation of the attraction of the solid  $ACB$  when it changes into  $Acb$ .

Again, by the line  $DC$ , when it revolves along with the rest of the figure about  $AB$ , a circle will be described; and by the part  $Cc$ , a circular ring, on which, if we suppose a solid of indefinitely small altitude to be constituted, it will make the element of the solid shell  $ACc$ . Now the attraction exerted by this circular ring upon  $A$  will be the same as if all the matter of it were united in the point  $C$ , and the same, therefore, as if it were all united in  $B$ .

But the circular ring generated by  $Cc$  is  $\pi (DC^2 - Dc^2) = 2\pi DC \times Cc$ . Now,  $2DC \times Cc$  is the variation of  $y^2$ , or  $D C^2$ , while  $DC$  passes into  $Dc$ , and the curve  $BCA$  into the curve  $bca$ ; that is,  $2DC \times Cc$  is the fluxion of  $y^2$ , or of  $a^2 x^2 - x^4$ , taken on the supposition that  $x$  is constant and  $a$  variable, namely  $\frac{4}{3} a^2 x \dot{a}$ . Therefore the space generated by  $Cc$  is  $\frac{4}{3} \pi a^2 x \dot{a}$ .

If this expression be multiplied by  $\dot{x}$ , we have the element of the shell  $= \frac{4}{3} \pi a^2 x \dot{a} \dot{x}$ .

In order to have the solidity of the shell  $ACBbc$ , the above expression must be integrated relatively to  $x$ , that is, supposing only  $x$  variable, and it is then  $\frac{2}{3} \times \frac{4}{3} \pi a^2 x^2 + C$ .

But  $C = 0$ , because the fluent vanishes when  $x$  vanishes, therefore the portion of the shell  $ACc = \frac{2}{3} x^2 a^2 \dot{a}$ , and when  $x = a$  the whole shell  $= \frac{4}{5} \pi a^2 \dot{a}$ .

Now, if the whole quantity of matter in the shell were united at  $B$ , its attractive force exerted on  $A$  would be the same with that of the shell, therefore the whole force of the shell  $= \frac{4}{5} \pi \dot{a}$ . The same is true for every other indefinitely thin shell, into which the solid may be supposed to be divided; and, therefore, the whole attraction of the solid is equal to  $\int \frac{4}{5} \pi \dot{a}$ , supposing  $a$  variable, that is,  $= \frac{4}{5} \pi a$ .

Hence we may compare the attraction of this solid with that of a sphere of which the axis is  $AB$ , for the attraction of that sphere  $= \frac{\pi}{6} a^3 \times \frac{4}{a^2} = \frac{2}{3} \pi \times a$ : the attraction of the solid  $ADBH$  (fig. 136), is, therefore, to that of the sphere on the same axis as  $\frac{4}{5} \pi a$  to  $\frac{2}{3} \pi a$ , or as 6 to 5.

VI. To find the content of the solid  $ADBH$ , we need only integrate the fluxionary expression for the content of the shell, namely,  $\frac{4}{5} \pi a^2 \dot{a}$ . We have then  $\frac{4}{15} \pi a^3 =$  the content of the solid  $ADBH$ . Since the solidity of the

solid here on the axis  $AB$  is  $= \frac{\pi}{6} a^3$ , the content of the solid

$ADBH$  is to that of the sphere on the same axis as  $\frac{4}{15} a^3$  to  $\frac{\pi}{6} a^3$ ; that is, as  $\frac{4}{15}$  to  $\frac{1}{6}$ , or as 8 to 5.

VII. Lastly, to compare the attraction of this solid with the attraction of a sphere of equal bulk.—Let  $m$  = any given mass of matter formed into the solid  $ADBH$ ; then for determining  $AB$ , we have this equation  $\frac{4}{15} \pi a^3 = m$ , and  $a =$

$$m^{\frac{1}{3}} \sqrt[3]{\frac{15}{4\pi}}; \text{ and, therefore, also, the attraction of the solid, (which is } \frac{4}{5} \pi a) = \frac{4}{5} \pi m^{\frac{1}{3}} \sqrt[3]{\frac{15}{4\pi}} = m \left( \frac{4 \cdot 5 \cdot 3 \cdot \pi}{4 \cdot 5} \right) = m \left( \frac{4 \cdot 3 \cdot \pi^{\frac{2}{3}}}{5} \right) = m^{\frac{2}{3}} \sqrt[3]{48\pi}.$$

Again, if  $m$  be formed into a sphere, the radius of that sphere  $= m^{\frac{1}{3}} \sqrt[3]{\frac{3}{4\pi}}$ , and the attraction of it on a particle at its surface  $\frac{m^{\frac{1}{3}}}{\left(\frac{3}{4\pi}\right)^{\frac{3}{2}}} = m^{\frac{1}{3}} \frac{(16\pi)}{9}$ .

Hence the attraction of the solid  $ADBH$ , is to that of a sphere equal to it, as  $m^{\frac{1}{3}} \left(\frac{48}{25} \pi^{\frac{2}{3}}\right)^{\frac{1}{2}}$  to  $m^{\frac{1}{3}} \left(\frac{16}{9} \pi^{\frac{2}{3}}\right)^{\frac{1}{2}}$ ; that is, as  $(27)$  to  $(25)$ , or as 3 to the cube root of 25.

The ratio of 3 to  $\sqrt[3]{25}$ , is nearly that of 3 to  $3 - \frac{2}{27}$ , or of 81 to 79; and this is therefore also nearly equal to the ratio of the attraction of the solid  $ADBH$ , to that of a sphere of equal magnitude.

VIII.—It has been supposed in the preceding investigation, that the particle on which the solid of greatest attraction exerts its force, is in contact with that solid. Let it now be supposed, that the distance between the solid and the particle is given; the solid being on one side of the plane and the particle at a given distance from the same plane on the opposite side. The mass of matter which is to compose the solid being given, it is required to construct the solid.

Let the particle to be attracted be at  $A$  (fig. 137), from  $A$  draw  $AA'$  perpendicular to the given plane, and let  $EF$  be any straight line in that plane drawn through the point  $A$ , it is evident that the axis of the solid required must be in  $AA'$  produced. Let  $B$  be the vertex of the solid, then it will be demonstrated as has been done above, that this solid is generated by the revolution of the curve of greatest attraction, that of which the equation is  $y^2 = a^2 x^2 - a^4$  about the axis of which one extremity is at  $A$ , and of which the length must be found from the quantity of matter in the solid.

The solid required then, is a segment of the solid of greatest attraction, having  $B$  for its vertex, and a circle of which  $A'E$  or  $A'F$  is the radius, for its base.

To find the solid content of such a segment,  $CD$  being  $y$ , and  $AC = x$ , we have  $y^2 = a^2 x^2 - a^4$ , and  $\pi y^2 \dot{x} = \pi a^2 x \dot{x} - \pi a^4 \dot{x}$  = the cylinder, which is the element of the solid segment.

Therefore  $\int \pi y^2 \dot{x}$ , or the solid segment intercepted between  $B$  and  $D$ , must be  $\int \pi a^2 x \dot{x} - \pi a^4 \dot{x} = C$ . This must vanish when  $x = a$ , or when  $C$  comes to  $P$ , and therefore

fore  $C = \frac{4\pi}{15} a^3$ . The segment therefore intercepted between B and C, the line AC being  $x$ , is  $\frac{4\pi}{15} a^3 - \frac{3\pi}{5} a^2 x + \frac{\pi}{3} x^3$ .

This also gives  $\frac{4\pi}{15} a^3$ , for the content of the whole solid, when  $x = 0$ , the same value that was found by another method at VI.

Now, if we suppose  $x$  to be  $= A A'$ , and to be given  $= b$ , the solid content of the segment becomes  $\frac{4\pi}{15} a^3 - \frac{3\pi}{5} a^2 b + \frac{\pi}{3} b^3$  which must be made equal to the given solidity, which we shall suppose  $m^3$ , and from this equation  $a$ , which is yet unknown, is to be determined. If then for  $a$ , we put  $u$ , we have  $\pi (\frac{4}{15} u^3 - \frac{3}{5} b u^2 + \frac{1}{3} b^3) = m^3$ , or  $\frac{4}{15} u^3 - \frac{3}{5} b u^2 + \frac{1}{3} b^3 = \frac{m^3}{\pi}$ , and  $u^3 - \frac{3}{4} b u^2 = \frac{15 m^3}{4\pi} - \frac{1}{4} b^3$ .

The simplest way of solving this equation would be by the rule of false position. In some particular cases it may be resolved more easily; thus, if  $\frac{15 m^3}{\pi} - \frac{1}{4} b^3 = 0$ ,  $u^3 - \frac{3}{4} b u^2 = 0$ , and  $u^3 = \frac{3}{4} b u^2$ , that is  $u = \frac{3}{4} b$ , or  $a = b \times (\frac{3}{4})^{\frac{1}{3}} = b \sqrt[3]{\frac{729}{64}}$ .

IX.—1. If it be required to find the equation to the superficies of the solid of greatest attraction, and also to the sections of its parallel to any plane passing through the axis: this can readily be done by help of what has been demonstrated above.

Let AHB (fig. 138), be a section of the solid, by a plane passing through AB its axis. Let G be any point in the superficies of the solid, GF a perpendicular from G on the plane AHB, and FE a perpendicular from F on the axis. Let AE =  $x$ , EF =  $z$ , FG =  $v$ , then  $x$ ,  $z$ , and  $v$  are the three co-ordinates by which the superficies is to be defined. Let AB =  $a$ , EH =  $y$ , then from the nature of the curve AHB,  $y^2 = a^2 x^2 - v^2$ . But, because the plane GEH is at right angles to AB, G and H are in the circumference of a circle of which E is the centre; so that GE = EH =  $y$ . Therefore  $EF^2 + FG^2 = EH^2$ , that is  $z^2 + v^2 = y^2$ , and by substitution for  $y^2$  in the former equation,  $z^2 + v^2 = a^2 x^2 - v^2$ , or  $(x^2 + z^2 + v^2) = a^2 x^2$  which is the equation to the superficies of the solid of greatest attraction.

2. If we suppose EF, that is  $z$ , to be given  $= b$ , and the solid to be cut by a plane through FG and CD (CD being parallel to AB) making on the surface of the solid the section DGC; and if AK be drawn at right angles to AB, meeting DC in K, then we have, by writing  $b$  for  $z$  in either of the preceding equations,  $b^2 + v^2 = a^2 x^2 - v^2$ , and  $v^2 = a^2 x^2 - x^2 - b^2$  for the equation to the curve DGC, the co-ordinates being GF and FK, because FK is equal to AE or  $x$ .

This equation also belongs to a curve of equal attraction; the plane in which that curve is being parallel to AB, the line in which the attraction is estimated, and distant from it by the space  $b$ .

Instead of reckoning the abscissa from K, it may be made to begin at C. If AE or CK =  $b$ , then the value of  $b$  is

determined from the equation  $b^2 = a^2 x^2 - b^2$ , and if  $x = b + u$ ,  $u$  being put for CF,  $v^2 = a^2 (b + u)^2 - (b + u)^2 - a^2 b^2 + b^2$ , or  $v^2 + (b + u)^2 + b^2 = a^2 (b + u)^2$ , or  $(v^2 + b + u)^2 + b^2 = a^2 (b + u)^2$ .

When  $b$  is equal to the maximum value of the ordinate EH (IV. 2) the curve CDG goes away into a point; and if  $b$  be supposed greater than this, the equation to the curve is impossible.

X.—The solid of greatest attraction may be found, and its properties investigated, in the way that has now been exemplified, whatever be the law of the attractive force. It will be sufficient in any case to find the equation of the generating curve, or the curve of equal attraction.

Thus, if the attraction, which the particle C (fig. 136.) exerts on the given particle at A, be inversely as the  $m$  power of the distance, or as  $\frac{1}{AC^m}$ , then the attraction

in the direction AE will be  $\frac{AE}{AC^{m+1}}$ , and if we make this  $= \frac{1}{AB^m}$ , we have  $\frac{AE}{AC^{m+1}} = \frac{1}{AB^m}$ , or making

AE =  $x$ , EC =  $y$ , and AB =  $a$ , as before  $\frac{x}{(x^2 + y^2)^{\frac{m+1}{2}}} = \frac{1}{a^m}$ , or  $a^m x = (x^2 + y^2)^{\frac{m+1}{2}}$  and  $x^2 + y^2 = \frac{2m}{a^{m+1}} \frac{x}{y}$  or  $y^2 = \frac{2m}{a^{m+1}} \frac{x}{y} - x^2$ .

If  $m = 1$ , or  $m + 1 = 2$ , this equation becomes  $y^2 = a x - x^2$ , being that of a circle of which the diameter is AB. If, therefore, the attractive force were inversely as the distance, the solid of greatest attraction would be a sphere.

If the force be inversely as the cube of the distance, or  $m = 3$ , and  $m + 1 = 4$ , the equation is  $y^2 = a^2 x^{\frac{1}{2}} - x^2$  which belongs to a line of the fourth order.

If  $m = 4$ , and  $m + 1 = 5$ , the equation is  $y^2 = a^3 x^{\frac{1}{3}} - x^2$ , which belongs to a line of the tenth order.

In general, if  $m$  be an even number, the order of the curve is  $m + 1 \times 2$ ; but if  $m$  be an odd number, it is  $m + 1$  simply.

In the same manner that the solid of greatest attraction has been found, may a great class of similar problems be resolved. Whenever the property that is to exist in the greatest or least degree belongs to all the points of a plane figure, or to all the points of a solid, given in magnitude, the question is reduced to the determination of the locus of a certain equation, as in the preceding example.

Let us, for instance, be required to find a solid given in magnitude, such, that from all the points in it, straight lines being drawn to any number of given points, the sum of the squares of the lines so drawn shall be a minimum. It will be found, by reasoning, as in the case of the solid of greatest attraction, that the superficies bounding the required solid must be such, that the sum of the squares of the lines drawn from any point in it, to all the given points, must be always of the same magnitude. Now, the sum of the squares of the lines drawn from any point, to all the given points, may be shewn by plane geometry, to be equal to the square of the line drawn to the centre of gravity of these given points, multiplied by the number of points together with a given space. The line, therefore, drawn from any point in the required superficies, to the centre of gravity of the given points, is given in magnitude, and therefore the superficies is that of a sphere,

sphere, having for its centre the centre of gravity of the given points.

The magnitude of the sphere is next determined from the condition that its solidity is given.

In general, if  $x, y$  and  $z$  are three rectangular co-ordinates, that determine the position of any point of a solid given in magnitude, and if the value of a certain function  $\zeta$  of  $x, y,$  and  $z$  be computed for each point of the solid, and if the sum of all these values of  $\zeta$  added together be a maximum or a minimum, the solid is bounded by a superficies, in which the function is every where of the same magnitude. That is, if the triple integral  $\int x y z \zeta$  be the greatest or least possible, the superficies bounding the solid is such, that  $\zeta = A$ , a constant quantity.

The same holds of plane figures. The proposition is then more simple, as there are only two co-ordinates, so that  $\int x y \zeta$  is the quantity that is to be a maximum or minimum, and the line bounding the figure is defined by the equation  $\zeta = A$ .

All the questions therefore that come under this description, though they belong to an order of problems, which requires in general the application of one of the most refined inventions of new geometry, the *calculus variationum*, form a particular division, admitting of solution by much more simple means, and directly reducible to the construction of loci.

In these problems also, the synthetical demonstration will be found extremely simple. In the instance of the solid of greatest attraction, this holds remarkably. Thus it is obvious, that (fig. 136) any particle of matter placed within the curve  $A C B H$ , will attract the particle at  $A$  in the direction  $A B$ , less than any of the particles in that curve, and that any particle of matter within the curve will attract the particle at  $A$  more than any particle in the curve, and more, *a fortiori*, than any particle without the curve. The same is true of the whole superficies of the solid. Now if the figure of the solid be any how changed while its quantity of matter remains the same, as much matter must be expelled from within the surface, at some one place  $C$ , as is accumulated without the surface, at some other point  $H$ . But the action of any quantity of matter within the superficies  $A C B H$  on  $A$  is greater than the action of the same without the superficies  $A C B H$ . The solid  $A C B H$  therefore by any change of its figure must lose more attraction than it gains. Thus is its attraction not distinguished by every such change, and therefore it is itself the solid of greatest attraction.

Among a number of propositions which the limits of our work do not permit us to notice, it is proposed, "to determine the oblate spheroid of a given solidity, which shall attract a particle at its pole with the greatest force." And it appears that the gravitation at the pole of an oblate spheroid is not a maximum, until the excentricity of the generating ellipse vanish, and the spheroid pass into a sphere. When a sphere passes into an oblate spheroid its attraction varies at first exceeding slowly, and continues to do so till its oblateness, or excentricity, becomes very great.

The cone of greatest attraction has the radius of its base nearly double that of its altitude, and the attraction of the cone, when a maximum, is about  $\frac{2}{3}$  the attraction of a sphere of equal solidity.

Of all the cylinders given in mass or quantity of matter, that which attracts a particle at the extremity of its axis with the greatest force is when the radius of the base of the cylinder is to the altitude as five to eight nearly, and it appears that the attraction of the cylinder, even when its form is the most advantageous, does not exceed that of a sphere of

the same solid content, by more than a hundred and eighty-third part.

A semi-cylinder given in magnitude, attracts a particle situated in the centre of its base, with the greatest force possible, in the direction of a line bisecting the base, and the altitude of the semi-cylinder is to the radius of its base as 125 to 216.

GRAVITATION, *Centre of.* See CENTER

GRAVITATION, *Line of.* See LINE

GRAVITATION, *Plane of.* See PLANE

GRAVITY, TERRESTRIAL, is that force by which all bodies are continually urged towards the centre of the earth.

It is in consequence of this force that a body cannot remain at rest on the surface of the earth, without exerting a pressure either on some intermediate body, or on that portion of the surface of the earth which sustains it; and the intensity of this force is measured by the degree of pressure, produced by a given mass. The tension of a spring, by which a weight is suspended, arises from the force of gravity. The spring steel-yard, an instrument sold at the shops for weighing, is extremely well adapted to illustrate the effect of the force of gravity: the suspended substance draws out a scale by overcoming the resistance of the spring. These machines are capable of great exactness, but if an instrument of this kind could be made with sufficient accuracy, the alteration of the scale, (the weight remaining the same,) would show any change in the force of gravity; and we might, by taking this apparatus to the summit of a high mountain, observe whether any change took place in the force of gravity by such an operation. We measure likewise the force of gravity by the time which a body, suffered to descend freely from a state of rest, employs to fall through a given space, or (as has been explained under *DYNAMICS*), by the velocity which a body, thus falling, acquires at the end of a given time. Thus a body, falling freely, during the interval of one second, acquires a velocity of 32, that is, it would strike an obstacle with the same force as another body would of the same mass, which was moving uniformly with the velocity of 32 per second.

The density of the earth being about 2.5 that of water, we infer that the force of gravity of a sphere, 8000 miles in diameter, and whose specific gravity is twice and a half that of water, would attract a particle of matter placed just without its surface, in such a manner as to cause it to move towards its centre, 16 feet in one second.

It is, however, to be observed, that it is only at the pole that the *whole* force of the earth's gravity is actually exerted on a particle of matter: at every other part of the earth's surface, the force of gravity is diminished by the motion of rotation, which producing a centrifugal force, opposite in its tendency to that of the force of gravity, diminishes the effect of the latter as we recede from the pole and approach the equator. But, besides this, there is another cause which contributes in a very remarkable manner to modify the force of gravity at different points of the earth's surface, which is the elliptic figure of the earth.

The equatorial regions being more elevated than the polar, are more removed from the influence of the central attraction. Both these circumstances, and their effects, must be attended to when we propose to make any very accurate computation of the force of terrestrial gravity.

The diminution of gravity arising from the elliptic figure is nearly equal to the product of the  $\frac{1}{25}$ th part of the force of gravity, by the square of the cosine of the latitude. The centrifugal force diminishes the force of gravity in the same proportion: thus by the combination of these two causes, the diminution of gravity from the pole to the

equator is equal  $0.00694$  multiplied by the square of the cosine of the latitude, the force of gravity at the equator being taken as unity.

The most exact instrument we possess, for measuring the intensity of the force, is the pendulum, whose oscillations are immediately accelerated or retarded by the slightest alteration in the force of gravity, and it is only by means of this instrument that we are enabled to infer with precision, the exact space that a heavy body falls through in one second of time.

GRAVITY, *The Nature of.*—Of the nature of gravitation, or the force of gravity, nothing more is known, than that it is apparently an essential property of matter, or, at least, of all matter that hitherto has become the object of human investigation, for Newton was not disposed to believe but that matter might exist which was not endowed with this property, and suggests the supposition that it is caused by the agency of an elastic medium pervading all space. This medium, he supposes, to be much rarer within the dense bodies of the sun, the stars, the planets, and the comets, than in the empty celestial spaces between them, and to grow more and more dense at greater distances from them, so that all these bodies are naturally forced towards each other by the excess of pressure. Upon this supposition, Dr. Young remarks, in his Lectures, that the effects of gravitation might be produced by a medium thus constituted, if its particles were repelled by all material substances with a force decreasing like other repulsive forces, simply as the distances increase; its density would then be every where such as to produce the appearance of an attraction, varying like that of gravitation. Such an ethereal medium would, therefore, have the advantage of simplicity, in the original law of its action, since the repulsive force, which is known to belong to all matter, would be sufficient, when thus modified, to account for the principal phenomena of attraction.

It may be questioned whether a medium, capable of producing the effects of gravitation in this manner, would also be equally susceptible of those modifications which have been supposed necessary to the transmission of light. In either case, it must be supposed to pass through the apparent substance of all material bodies with the most perfect freedom, and there would, therefore, be no occasion to apprehend any difficulty from a retardation of the celestial motion; the ultimate impenetrable particles of matter being, perhaps, scattered in a nebula, which has still the distant appearance of a uniform light; and there seems no reason to doubt the possibility of the propagation of an undulation through the Newtonian medium, with the actual velocity of light. It must be remembered, that the difference of its pressure is not to be estimated from the actual bulk of the earth, or any other planet alone, but from the effect of the sphere of repulsion of which that planet is the centre; and we may thus deduce the force of gravitation from a medium of no very enormous elasticity.

Dr. Young observes, that a similar combination of a simple pressure with a variable repulsion is also observable in the force of cohesion, and supposes that if two particles of matter, floating in such an elastic medium, capable of producing gravitation, were to approach each other, their mutual attraction would at once be changed from gravitation to cohesion, upon the exclusion of the portion of the medium intervening between them. The well known experiment of the two exhausted hemispheres of Magdeburg affords an illustration of this hypothesis, where we see apparent cohesion derived from atmospherical pressure, and if we place between them a thick ring of elastic gum,

we may represent the natural equilibrium between the forces of cohesion and repulsion, for the ring would resist any small additional pressure with the same force as would be required for separating the hemispheres so far as to allow it to expand in an equal degree; and at a certain point the ring would expand no more; the air would be admitted and the cohesion destroyed, as when a solid of any kind is torn asunder. These suppositions, however, are directly opposite to the hypothesis which assigns to the elastic medium the power of passing freely through all the interstices of the ultimate atoms of matter, since it could never pass between two atoms cohering in this manner; we cannot, therefore, at present assert the identity of the forces gravitation and cohesion so strongly as theory would allow us to do if established. In short, the whole of our enquiries respecting the intimate nature of forces must be considered as merely speculative amusements, which are of no farther utility than as they make our views more general, and assist our experimental investigations.

La Place, after having shown how the law of gravitation is deduced from the phenomena of the solar system, concludes his reflections on this subject by enquiring whether the principle of gravitation is a primordial law of nature, or if it may not be the general effect of some unknown cause? Here, he observes, we are flopped by our ignorance of the nature of the intimate properties of matter, and deprived of every hope of answering this question in a satisfactory manner. Instead, says this great author, of forming hypotheses on this subject, let us content ourselves with examining more particularly the manner in which this principle has been employed by philosophers.

They have admitted the five following suppositions:

1. That gravitation takes place between the most minute particles of bodies.
2. That it is proportional to the masses.
3. That it varies inversely as the square of the distance.
4. That it is transmitted instantaneously from one body to another.
5. And that it equally acts on bodies in a state of repose, and on those which by their motion in the direction of its action should seem likely to avoid a part of its influence.

The first of these propositions is, as we have seen, a necessary result of the equality which exists between action and re-action, every particle of the earth attracting it as the particle itself is attracted; this supposition is confirmed by the measures of the degrees of the meridian, and by experiments on pendulums; for amidst all the irregularities of the measured degrees, we may perceive the traces of a regular figure, which is conformable to the theory. The great influence that the compression of Jupiter has upon the nodes and perigees of the orbits of its satellites, proves to us that the attraction of this planet is composed of the attractions of all its particles. The proportionality of the attractive force to the masses is demonstrated in the earth by experiments on pendulums, the oscillations of which are of the same length of whatever substance they are composed. It is proved in the celestial regions by the constant relation which exists between the squares of the periodic times of bodies revolving about a common focus, to the cubes of the greater axes of their orbits.

We have seen with what precision the almost absolute state of repose of the perihelia of the planetary orbits indicate that the force of gravity varies according to the inverse square of the distance: and now that we know the cause of the motions of these perihelia, we may regard this law as rigorously exact. It is the same with all emanations which proceed from a centre, such as light;

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light; it seems as if all forces whose action could be perceived at sensible distances obeyed this law. It has lately been observed, that the attractions and repulsions of electricity and magnetism decrease in proportion to the squares of the distances. A remarkable property of this law is, that if the dimensions of all the bodies of the universe, their mutual distances and velocities were to be augmented or diminished proportionally, they would describe curves entirely similar to those described at present, and their appearances would be entirely the same. For the forces which animate them being entirely the result of attractions proportional to the masses divided by the squares of the distances, they would be augmented and diminished proportionally to the dimensions of this imaginary universe. It may be remarked at the same time that this property can only belong to the law of nature. Thus the apparent motions are independent of its absolute dimensions, as they are likewise of the motions it may have in space, and we can only observe and recognize relative phenomena.

It is this law which gives to spheres the property of attracting each other mutually, as if their whole masses were united at their respective centres. It terminates also the orbits and the figures of the celestial bodies by lines and surfaces of the second order, at least if we neglect their perturbations and suppose them fluid.

We have no method of measuring the length of time in which gravity is propagated, because the action of the sun having once reached the planets, it continues to act on them as if the attractive force was communicated instantaneously to the extremities of the system. We cannot, therefore, ascertain in how long a time it is transmitted to the earth, no more than we could measure the velocity of light, were it not for the aberration, and the eclipses of Jupiter's satellites. But it is not the same with the small difference that may exist in the action of gravity upon bodies according to the direction of their velocity.

M. de la Place has found by analysis, that an acceleration should result in the mean motions of the planets round the sun, and in the mean motions of the satellites about their planets.

M. de la Place had assumed this method of explaining the secular equation of the moon, when he believed, with other geometers, that it was inexplicable on the principle of universal gravitation. He found that if it arose from this cause, a velocity must be supposed to exist in the centre of the moon, in order to release it entirely from its gravity towards the earth, at least six million times greater than that of light: the true cause of this equation being now known, we are certain that the action of gravity is much greater than this. This force, therefore, acts with a velocity which we may consider as infinite; and we may conclude, that the action of the sun is transmitted in an indivisible instant to the extremities of the planetary system.

Do any other forces act on the heavenly bodies besides their mutual attractions?

We are unacquainted with any, and we may affirm that their effect is totally insensible. We may likewise be certain that these bodies experience no sensible resistance from the fluids through which they pass, as light, the tails of comets, or the zodiacal light.

The attractive force disappears between bodies of an inconsiderable magnitude, and re-appears in their elements under a variety of forms. The solidity of bodies, their crystallization, the refraction of light, the elevation and depression of fluids in capillary tubes, and all chemical combinations, generally are the results of attractive forces, the

knowledge of which forms the principal object of natural philosophy.

Are these forces the same as that of the gravity observed in the celestial regions, and modified on the earth by the figures of the integrant particles? To admit this hypothesis we must suppose much more space empty than full in all bodies, so that the density of their particles must be incomparably greater than the mean density of their whole volume. A spherical particle of one hundred thousandth of a foot in diameter should have a density at least ten thousand million of times greater than the mean density of the earth, to exert at its surface an attraction equal to the terrestrial gravity. But the attractive forces of bodies greatly surpass this gravity, since they deflect light, whose direction is not changed by the attraction of the earth. The density of these particles should, therefore, be to that of substances in a ratio which the imagination would fear to admit, if their affinities depended on the law of universal gravitation. The ratio of the intervals which separate the particles of bodies to their respective dimensions, would be of the same order as in stars which form a nebula, which in this point of view may be considered as a great luminous body. There is no reason, however, which absolutely forbids us to consider all bodies in this manner. Many phenomena are favourable to the supposition, particularly the extreme facility with which light penetrates diaphanous substances in all directions. The affinities would then depend on the integrant particles, and we might, by the variety of these forms, explain all the variety of attractive forces, and reduce to one general law all the phenomena of astronomy and natural philosophy. But the impossibility of ascertaining these figures, renders this investigation useless to the advancement of science.

Some geometers, to account for these affinities, have added to the laws of attraction, inversely as the squares of the distances, new terms which are insensible at small distances; but these terms would be the expressions of as many different forces, and besides being complicated with the different figures of the particles, they would only complicate the explanation of the phenomena.

Amidst these uncertainties the wisest plan seems to be, to endeavour to determine by numerous experiments the laws of affinities; and to effect this, the most simple method appears to be, by comparing these forces with the repulsive force of heat, which may be itself compared with that of gravity. Some experiments already made with this view, afford us reason to hope, that one day these laws will be perfectly known, and that then, by the application of analysis, the philosophy of terrestrial bodies may be brought to the same degree of perfection, which the discovery of universal gravitation has procured for astronomy.

**GRAVITY, in Hydrostatics.** The laws of bodies gravitating in fluids, make the business of hydrostatics.

Gravity is here divided into *absolute* and *specific*.

**GRAVITY, absolute or true,** is the whole force wherewith the body tends downward.

**GRAVITY, specific,** called also *relative, comparative,* and *apparent gravity,* is the excess of gravity in any body, above that of an equal quantity or bulk of another; and denotes that gravity, or weight, peculiar to each species, or kind of natural body; and whereby it is distinguished from all other kinds.

In this sense, a body is said to be *specifically heavier* than another, when under the same bulk it contains a greater weight than that other; and that other is said to be *specifically lighter* than the first. Thus, if there be two equal spheres, each a foot in diameter; the one wood, the other lead, since the leaden one is found heavier than the wooden

one, it is said to be *specifically*, or in *specie*, heavier: and the wooden one *specifically* lighter.

This kind of gravity some call *relative*; in opposition to *absolute* gravity, which increases in proportion to the quantity or mass of the body.

GRAVITY, *laws of the specific, and levity of bodies*.—I. If two bodies be equal in bulk, their specific gravities are to each other as their absolute gravities. Thus a body is said to be twice as heavy, *specifically*, as another, if it have twice its gravity under the same bulk.

Hence, the specific gravities of equal bodies are as their densities.

II. If two bodies, compared together, be of the same specific gravity, their absolute weights will be as their magnitudes or bulks.

III. The specific gravities of bodies of the same weight are in the reciprocal ratio of their bulks. Hence the masses of two bodies of the same weight are in a reciprocal ratio of their bulks.

IV. The specific gravities of two bodies are in a ratio compounded of the direct ratio of the absolute gravities, and the reciprocal one of their bulks. Hence, again, the specific gravities are as the densities.

V. The absolute gravities of two bodies will be in a compound ratio of their specific gravities and their bulks.

VI. The bulks of two bodies will be in a compound ratio of their absolute gravities directly, and their specific gravities inversely.

VII. A body specifically heavier than a fluid, loses so much of its weight therein as is equal to the weight of a quantity of the fluid of the same bulk.

For, suppose a cubic inch of lead immersed in water; a cubic inch of water will, thereby, be expelled from its place: but the weight of this water was sustained by the resistance of the ambient water. Therefore, such a part of the weight of the leaden cube must be sustained by the resistance of the ambient water, as is equal to the weight of the water expelled. The gravity of the body immersed, therefore, must be diminished by so much.

Hence, 1. Since a fluid, specifically heavier, has a greater weight, in the same bulk, than a lighter; the same body will lose a greater part of its weight in a fluid, specifically heavier, than in a lighter: and therefore it weighs more in a lighter than a heavier.

2. Equal homogeneous bodies weighing equally in air, lose their equilibrium if one of them be immersed in a heavier fluid; the other in a lighter.

3. Since the specific gravities are as the absolute gravities under the same bulk; the specific gravity of the fluid will be to the gravity of the body immersed, as part of the weight lost by the solid, to the whole weight.

4. Two solids, equal in bulk, lose the same weight in the same fluid: but the weight of the specifically heavier body is greater than that of the specifically lighter; therefore, the specifically lighter loses a greater part of its weight than the specifically heavier.

5. Since the bulks of bodies, equal in weight, are reciprocally as the specific gravities; the specifically lighter loses more weight in the same fluid than the heavier; wherefore, if they be in equilibrio in one fluid, they will not be so in another; but the specifically heavier will preponderate, and that the more, as the fluid is denser.

6. The specific gravities of fluids are as the weights lost by the same solid immersed in the same.

VIII. *To find the specific gravity of a fluid*.—On one arm of a balance suspend a leaden globe; and to the other, fasten a weight, which is in equilibrium therewith in the air. Im-

merge the globe successively in the several fluids, whose specific gravities are to be determined, and observe the weight which balances it in each. These several weights, subtracted, severally, from the first weight, the remainders are the parts of the weight lost in each fluid. Whence the ratio of the specific gravity of the fluids is seen.

Hence, as the densities are as the specific gravities, we find the ratio of the densities of the fluids at the same time.

This problem is of the utmost use: as by it the degree of purity or goodness of fluids is easily found; a thing not only of service in natural philosophy, but also in common life, and in the practice of physic. See HYDROMETER.

That the specific gravity may be found the more accurately, the weight of the thread not immersed in the fluid is to be subtracted from the weight of the solid in air; and the force necessary to make the thread subside (if it be specifically lighter) is to be added to the weight lost. But if the thread that sustains the solid be heavier than the fluid, the weight of the thread in the air is to be subtracted from the weight of the solid in air; and the weight the thread loses from the weight lost in the fluid. Indeed, this precaution may be spared, if, in examining the specific gravity of several fluids, care be taken that the same thread be immersed to the same depth in each.

IX. To determine the ratio which the specific gravity of a fluid has to the specific gravity of a solid that is specifically heavier than the fluid,

Weigh any mass of the solid in a fluid, and note the just weight therein: the specific gravity of the fluid will be to that of the solid, as the part of the weight lost by the solid to its whole weight.

X. The specific gravities of equally heavy bodies are reciprocally as the quantities of weight lost in the same fluid. Hence we find the ratio of the specific gravities of solids, by weighing masses thereof, that are equal in air, in the same fluid; and noting the weights lost by each.

XI. A body, specifically heavier, descends in a fluid specifically lighter, with a force equal to the excess of its weight, above that of an equal quantity of the fluid.

Hence, 1. The force which sustains a specifically heavier body in a fluid, is equal to the excess of the absolute gravity of the body, above that of the fluid, under the same bulk: *e. gr.*  $47\frac{1}{2}$  pound of copper loses  $5\frac{1}{2}$  pounds of its weight in water; therefore a power of 42 pounds is able to sustain it.

2. Since the excess of the weight of a solid over the weight of a fluid specifically heavier, is less than that over the weight of a specifically lighter fluid under the same bulk; it will descend with less force in a specifically heavier fluid than in a lighter; and, consequently, it will descend more slowly in the former than in the latter.

XII. A specifically lighter body sinks in a heavier fluid, till the weight of a quantity of the fluid, equal in bulk to the part immersed, be equal to the weight of the whole body.

Hence, 1. Since the specific gravities of bodies of the same weight are reciprocally as their bulks; and the bulks of fluids equal in weight, are as the parts of the same solid immersed therein; the specific gravities of fluids are reciprocally as the parts of the same body immersed therein.

2. A solid, therefore, immerses deeper in a lighter fluid than in a heavier, and deeper, as the proportion of the specific gravity of the solid to that of the fluid is greater.

3. If a body be of the same specific gravity with a fluid,

the



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the whole body will be immersed; and it will remain in any given place of the fluid.

4. If a specifically lighter body be wholly immersed in a fluid, it will be urged, by the collateral columns of the fluid, to ascend with a force equal to the excess of the weight of the fluid, bulk for bulk, over the weight of the solid.

5. A body, therefore, specifically lighter, lying on the bottom of a vessel, will not be raised up, unless the heavier fluid rise above such a part as is equal in bulk to a quantity of the fluid of the same weight with the whole solid.

XIII. The specific gravity of a solid is to the specific gravity of a lighter fluid, wherein it is immersed, as the bulk of the part immersed is to the whole bulk.

XIV. The specific gravities of equal solids are as their parts immersed in the same fluid.

XV. The weight and bulk of a specifically lighter body, and the weight of the specifically heavier fluid, being given, to find the force required, to keep the solid wholly immersed under the fluid.

As this force is equal to the excess of the weight of the fluid beyond that of an equal bulk of the solid; from the given bulk of the solid, and the weight of a cubic foot of water, find, by the rule of three, the weight of a bulk of water equal to that of the body. From this subtract the weight of the solid; the remainder is the force required. *E.g.* Suppose the force necessary to detain a solid eight feet in bulk, and 100 pounds in weight, under water, required: since a cubic foot of water is found to weigh 70 pound, the weight of water under the bulk of eight feet, is 560; whence, 100 pound, the weight of the solid, being subtracted; the remainder 460 pound is the force necessary to detain the solid under water.

Hence, since a specifically lighter body ascends in a heavier fluid, with the same force that would prevent its ascent; by the present problem, we can likewise find the force wherewith a specifically lighter body ascends in a heavier.

XVI. The weight of a vessel, to be made of a specifically heavier matter; and that of a specifically lighter fluid, being given: to determine the cavity the vessel must have to swim on the fluid.

The weight of a cubic foot of the fluid being given, the bulk of the fluid equal to the weight of the vessel is found by the rule of three. If, then, the cavity be made a little bigger than this, the vessel will have less weight under the same bulk than the fluid, and will therefore be specifically lighter than the same, and consequently it will swim.

XVII. The force employed to retain a specifically lighter solid, under a heavier fluid; and the weight lost by a heavier solid in a lighter fluid, are each added to the weight of the fluid, and weigh together with it.

The several theorems here delivered, are not only all demonstrable from the principles of mechanics, but are conformable to experiment. In effect, experience is here found to answer exactly to calculation, as is abundantly evident from the courses of philosophical experiments, now frequently exhibited; where the laws of specific gravitation are well illustrated. See *HYDROSTATICAL balance*.

The specific gravity of any substance is the relative weight of a given volume of it, compared with the same volume of some other substance taken as a standard, and which is usually distilled water at some given temperature. The absolute gravity of a body is its entire weight, its specific gravity is the weight of a given portion, as a

cubic foot or cubic inch. As it would be very difficult, and in many cases impossible, to measure the exact volume required to be weighed, a method of determining the specific gravity of solids has been devised, founded on a principle of *Hydrostatics*. It appears to have been known to Archimedes, that when a solid body, heavier than water, is plunged into that fluid, it loses as much of its weight as is equal to the weight of the fluid it has displaced.

By the application of this principle we are enabled, in a very easy manner, to determine the specific gravity of a body by first weighing it in air and afterwards in water. Then if the weight in air be divided by the weight lost, or the difference of the weights in water and air, the quotient will express the specific gravity of that body, or the relative weight of an equal volume of that substance, and of the water in which the experiment was made.

The specific gravity of two fluids may be determined by the same principle; for if we weigh a solid of any magnitude, as a ball of glass, first in water and then in any other fluid, the quantities of weight lost in each experiment will be in the same proportion as the specific gravity of the two fluids.

The specific gravities of any substances, and in particular of such as are lighter than water, may also be very conveniently determined by means of a common balance, employing a phial with a conical ground stopple filling it first with water and then either with a given fluid, or with a portion of the solid of which the weight has been ascertained, together with as much water as is sufficient to exclude the air.

It is necessary to attend to a great number of minute circumstances when we wish to determine the specific gravities of substances to a great degree of accuracy: these will be particularly noticed when describing the particular instruments that have been invented for the purpose. See *HYDROSTATIC Balance*, *HYDROMETER*, &c.

One mode of ascertaining the specific gravities of fluids, differing but little from each other in density, is to have a series of globules of glass so loaded, as to correspond to the specific gravities indicated by as many numbers, which are marked on them, and throwing several of them together into the fluid, and to observe which of them remains nearly stationary, without either rising to the surface or sinking. This method, though not expeditious, appears to be very secure from error, and is well adapted to determine the strength of spirituous liquors. But in all these experiments it is necessary to be aware that a considerable change of the joint bulk of two substances is often produced by their mixture, and that in general their dimensions are considerably contracted. Thus, 18 gallons of water and 18 gallons of alcohol, instead of 36 gallons, make only 35, consequently the specific gravity of the compound is one 35th greater than the mean of the specific gravities of the ingredients. And in some cases the whole dimension of a single substance may even be contracted by the addition of another substance; thus iron, by the addition of one-eighth of its bulk of platina, becomes contracted one-fortieth of that bulk.

For measuring the specific gravity of gases, Mr. Leslie has devised a new method, which consists in observing the time employed in emptying a vessel through a small orifice, by means of the pressure of an equal column of water.

### *A Table of Specific Gravities.*

Principally from Davies and Lavoisier. Davies's table is compiled with great diligence from many different authors; Lavoisier's is chiefly extracted from Billien: it is carried

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to four places of decimals, but little dependence can be placed on the last.		Mineral Productions.	Solids.			
					Beryl, or oriental aquamarine	3.5489
					Occidental aquamarine	2.722
					Diamond, rose-coloured	3.5310
					white	3.5212
					lightest	3.501
Platina, purified	-	-	-	19.5000	Manganese crude	3.53
hammered	-	-	-	20.3366	Black schorl, crystallized	3.3852
Platina, wire	-	-	-	21.0417	amorphous	2.9225
laminated	-	-	-	22.0690	Flint glass	2.933.3
Pure gold, cast	-	-	-	19.2581	White glass	2.8922
hammered	-	-	-	19.3617	Bottle glass	2.7325
Gold 22 carats fine, of the standards of London and of Paris, cast	-	-	-	17.4863	Green glass	2.6423
hammered	-	-	-	17.5894	Glass of St. Gobin	2.4882
French gold coin 21 $\frac{1}{2}$ carats fine, cast	-	-	-	17.4022	Fluor, red	3.1911
coined	-	-	-	17.6474	green	3.1817
French trinket gold, 20 carats fine, cast	-	-	-	15.7090	violet	3.1757
hammered	-	-	-	15.7746	blue	3.1683
Mercury	-	-	-	13.5681	white	3.1555
Lead, cast	-	-	-	11.3523	Black and white hone	3.1311
Litharge	-	-	-	6.30	White hone	2.8763
Pure silver, cast	-	-	-	10.4742	Granitello	3.0626
hammered	-	-	-	10.5107	Green serpentine of Dauphiné	2.9883
Parthian silver, 11 den. 10. gr. fine, cast	-	-	-	10.1753	Green serpentine	2.8960
hammered	-	-	-	10.3765	Ophite	2.9722
French silver coin, 10 den. 21 gr. fine, cast	-	-	-	10.0476	Green jade	2.9660
hammered	-	-	-	10.4077	White jade	2.9502
Bismuth, cast	-	-	-	9.8227	Black mica	2.9004
Copper cast	-	-	-	8.7880	Basaltes, from the Giant's caufeway	2.8642
wire	-	-	-	8.8785	Basaltes from Auvergne	2.4153
Brass, cast	-	-	-	8.3958	White Parian marble	2.8376
Brass wire	-	-	-	8.5441	Green marble	2.7417
Cobalt, cast	-	-	-	7.8119	Red marble	2.7242
Nickel, cast	-	-	-	7.8070	White marble of Carrara	2.7168
Iron, cast	-	-	-	7.2070	Jafponyx	2.8160
Bar iron	-	-	-	7.7880	Chryfolith	2.7821
Steel, hard, not serewed	-	-	-	7.8163	Chryfolith of Brasil	2.6923
serewed	-	-	-	7.8180	Peruvian emerald	2.7755
soft, not serewed	-	-	-	7.8331	Red porphyry	2.7651
serewed	-	-	-	7.8404	Jasper, grey	2.7640
Leadstone	-	-	-	4.80	violet	2.7111
Haematite	-	-	-	4.20	yellow	2.7101
Tin, cast	-	-	-	7.2914	brown	2.6911
serewed	-	-	-	7.2994	red	2.6612
Zinc, cast	-	-	-	7.1908	White antique alabaster	2.7302
Antimony, cast	-	-	-	6.7021	Rhombic calcareous spar	2.7151
Glass of antimony	-	-	-	4.9464	Pyramidal calcareous spar	2.7141
Crude antimony	-	-	-	4.0643	Slate	2.6718
Tungstein	-	-	-	6.0665	Pitchstone, red	2.6695
Arsenic, cast	-	-	-	5.7633	blackish	2.3191
Molybdena	-	-	-	4.7385	yellow	2.0860
Ponderous spar	-	-	-	4.4300	black	2.0499
Jargon of Ceylon	-	-	-	4.4161	Onyx pebble	2.6644
Oriental ruby	-	-	-	4.2833	Transparent chalcadony	2.6640
Spinelite ruby	-	-	-	3.7600	Red Egyptian granite	2.6541
Ballas ruby	-	-	-	3.6458	Pure rock crystal	2.6530
Brasilian ruby	-	-	-	3.5311	Amorphous quartz	2.6471
Pseudotopaz	-	-	-	4.27	Agate onyx	2.6375
Bohemian garnet	-	-	-	4.1881	Carnelian	2.6137
Syrian garnet	-	-	-	4.0000	Sardonyx	2.6021
Sapphire of Puy	-	-	-	4.0760	Purbeck stone	2.601
Oriental sapphire	-	-	-	3.9941	White flint	2.5941
Sapphire of Brasil	-	-	-	3.1307	Blackish flint	2.5817
Oriental topaz	-	-	-	4.0106	Oriental agate	2.5901
Saxon topaz	-	-	-	3.5640	Prase	2.5805
Brasilian topaz	-	-	-	3.5365	Portland stone	2.570
Emery	-	-	-	4.00	Whetstone of Auvergne	2.5638
Hyacinth	-	-	-	3.6873	Red zeolithe	2.4868

# GRAVITY.

Crystallized zeolite	2.0833	Atmospheric air	1.000	.00123
Millstone	2.4835	Nitrogen gas	.985	.00122
Paving stone	2.4158	Ammoniacal gas	.600	
Touchstone	2.4153	Hydrogen gas	.084	.000096
Chinese porcelain	2.3847			
Porcelain of Limoges	2.3410	<i>Vegetable Productions.</i>		
Porcelain of Seves	2.1457	Crystals of tartar		1.850
Lapis obidianus	2.3480	Extract of liquorice		1.7228
Selenite	2.322	Opopanax		1.6226
Sulphate of potash	2.250	White sugar		1.626
Sulphate of soda	2.200	Solution of potash		1.570
Grindstone	2.1429	Gum arabic		1.4523
Salt	2.130	Honey		1.450
Native sulphur	2.0332	Cat-chu		1.3980
Melted sulphur	1.9907	Aloes, focotrine		1.3795
Transparent sulphur	1.950	Aloes, hepatic		1.3586
Nitre	2.000	Bdellium		1.3717
Brick	2.000	Myrrh		1.3600
Alabaster	1.874	Pomegranate tree		1.3540
Plumbago	1.86	Cocoa shell		1.345
Sulphate of zinc	1.850	Opium		1.3366
Alum	1.720	Lignum vitæ		1.3330
Borax	1.718	Box, Dutch		1.328
Sulphate of iron	1.700	French		.912
Asphaltum	1.400	Affacetida		1.3275
Scotch coal	1.300	Tragacanth		1.3161
Newcastle coal	1.270	Ivy gum		1.2948
Staffordshire coal	1.240	Scammony, from Smyrna		1.2743
Jet	1.238	Aleppo		1.2354
Ice, probably	.930	Sarcocolla		1.2684
Pumice stone	.9145	Myrrh		1.250
		Guaiacum		1.2289
<i>Liquids.</i>		Gamboge		1.2201
Sulphuric acid	1.8409	Refin of jalap		1.2185
Ph Lond.	1.850	Galbanum		1.2120
Nitrous acid, Ph. Lond.	1.550	Gum ammoniac		1.2071
Nitric acid	1.2175	Dragon's blood		1.2045
Solution of falt	1.244	Sagapenum		1.2008
Water 27, falt 10	1.240	Lignum nephriticum		1.200
Water 3, falt 1	1.217	Ebony		1.177
Water 12, falt 1	1.060	Olibanum		1.1732
Water of the Dead sea	1.2403	Heart of oak, 60 years old		1.1700
Sea water	1.0263	Dry oak		.932
Solution of caustic soda	1.200	Pitch		1.150
Muriatic acid	1.1940	Copal, opaque		1.1398
Water of the Seine, filtered	1.0015	transparent		1.0452
Naphtha	.708	Euphorbium		1.1244
		Storax		1.1098
<i>Substances partly Mineral.</i>	<i>Solids.</i>	Oil of fassafra		1.094
Acetite of lead	2.700	Benzoin		1.0924
Tartrite of antimony	2.100	Sandarac		1.0920
Muriate of ammonia	1.400	Yellow amber		1.0780
		Mastic		1.0742
<i>Liquids.</i>		Yellow resin		1.0727
Sulphuric ether	.7394	Frankincense		1.071
Nitric ether	.9088	Mahogany		1.063
Muriatic ether	.7298	Acetic acid		1.0626
		Oil of cinnamon		1.0439
<i>Elastic Fluids.</i>		Anime, occidental		1.0426
		oriental		1.0284
Kirwan.	Lavoifier.	Barometer 30".		1.0382
		Thermom. 52".		1.0363
Sulphureous acid gas	2.265	Malmfey Madeira		1.034
Carbonic acid gas	1.500	Oil of cloves		1.0182
Nitrous gas	1.194	Gall nuts		1.0181
Hepatic gas	1.106	Elemi		1.0095
Oxygen gas.	1.103	Cyder		1.0000
		Distilled vinegar		1.0000
		Water at 60		Extract

# GRAVITY.

Extract from Mr. Gilpin's Table; Phil. Transf. 1794.

Water.	Alcohol.	at 30°.	40°.	50°.	60°.	70°.	80°.	
10	0	1.00774	1.00094	1.00068	1.00000	.99894	.99759	
10	1	.98804	.98795	.98745	.98654	.98527	.98367	
10	2	.98103	.98033	.97920	.97771	.97596	.97385	
10	3	.97635	.97472	.97284	.97074	.96836	.96568	
10	4	.97200	.96967	.96708	.96437	.96143	.95826	
10	5	.96719	.96434	.96126	.95704	.95469	.95111	
10	6	.96209	.95879	.95534	.95181	.94813	.94431	
10	7	.95681	.95328	.94958	.94579	.94193	.93785	
10	8	.95173	.94802	.94414	.94018	.93616	.93201	
10	9	.94675	.94295	.93897	.93493	.93076	.92646	
10	10	.94222	.93827	.93419	.93002	.92580	.92142	
9	10	.93741	.93341	.92919	.92499	.92069	.91622	
8	10	.93191	.92783	.92358	.91933	.91493	.91046	
7	10	.92563	.92151	.91723	.91287	.90847	.90385	
6	10	.91847	.91428	.90997	.90549	.90104	.89629	
5	10	.91023	.90596	.90160	.89707	.89252	.88781	
4	10	.90054	.89617	.89174	.88720	.88254	.87776	
3	10	.88921	.88481	.88030	.87569	.87105	.86622	
2	10	.87585	.87134	.86676	.86208	.85736	.85248	
1	10	.85957	.85507	.85042	.84568	.84092	.83603	
0	10	.83896	.83445	.82977	.82500	.82023	.81530	
Bordeaux wine	-	-	-	.9239	Pear tree	-	-	.6618
Burgundy wine	-	-	-	.9915	Fir, yellow	-	-	.657
Liquid turpentine	-	-	-	.9910	white	-	-	.569
Camphor	-	-	-	.9887	Male fir	-	-	.5500
Oil of mint	-	-	-	.975	Female fir	-	-	.4980
Oil of nutmeg	-	-	-	.948	Cypress	-	-	.6440
Medlar tree	-	-	-	.9440	Lime tree	-	-	.6040
Linseed oil	-	-	-	.9403	Gilbert wood	-	-	.6000
Oil of caraway	-	-	-	.940	Arnotto	-	-	.5956
Oil of marjoram	-	-	-	.940	Willow	-	-	.5850
Oil of spike	-	-	-	.936	Cedar	-	-	.5608
Oil of rosemary	-	-	-	.934	Juniper wood	-	-	.556
Elastic gum	-	-	-	.9335	White Spanish poplar	-	-	.5294
Oil of poppy seed	-	-	-	.9288	Poplar	-	-	.3830
Olive wood	-	-	-	.9270	Saffrafas wood	-	-	.482
Oil of beech mast	-	-	-	.9177	Cork	-	-	.2400
Oil of almonds	-	-	-	.9106				
Olive oil	-	-	-	.9153				
Logwood	-	-	-	.913	Pearl	-	-	2.750
Rape oil	-	-	-	.913	Coral	-	-	2.680
Balsam of Tolu	-	-	-	.896	Sheep's bone, recent	-	-	2.222
Oil of lavender	-	-	-	.8938	Oyster shell	-	-	2.092
Oil of oranges	-	-	-	.888	Ivory	-	-	1.917
Essential oil of turpentine	-	-	-	.8697	Stag's horn	-	-	1.875
Acetic ether	-	-	-	.8664	Ox's horn	-	-	1.840
Beech	-	-	-	.8520	Blade bone of an ox	-	-	1.656
Ash	-	-	-	.8450	Lac	-	-	1.1390
Yew, Spanish	-	-	-	.8070	Itinglafs	-	-	1.111
Dutch	-	-	-	.7880	Egg of a hen	-	-	1.090
Alder	-	-	-	.8000	Human blood	-	-	1.053
Elm	-	-	-	.800	Blood, buff coat	-	-	1.056
Apple tree	-	-	-	.7930	ferum	-	-	1.056
Plumb tree	-	-	-	.7550	red globules	-	-	1.028
Indigo	-	-	-	.7690	Ewe's milk	-	-	1.0405
Maple	-	-	-	.7550	to .663	Affes' milk	-	1.0355
Cherry tree	-	-	-	.7150	to .663	Mare's milk	-	1.0346
Quince tree	-	-	-	.7050	to .663	Goat's milk	-	1.0341
Orange tree	-	-	-	.7050	to .663	Cow's milk	-	1.0324
Walnut	-	-	-	.6710	to .663	Woman's milk	-	1.0203
						Whey of cow's milk	-	1.0193
						Wax, white	-	.9686
						Wax,		

*Animal Substances.*

Wax, yellow	-	-	-	-	.9648
Lard	-	-	-	-	.9479
Spermaceti	-	-	-	-	.9433
Butter	-	-	-	-	.9423
Tallow	-	-	-	-	.9419
Fat of hogs	-	-	-	-	.9368
of veal	-	-	-	-	.9342
of mutton	-	-	-	-	.9235
of beef	-	-	-	-	.9232
Ambergrease	-	-	-	-	.9263
Lamp oil	-	-	-	-	.9233
Solution of pure ammonia	-	-	-	-	.8970

GRAVITY, in *Mechanics*, denotes the conatus or tendency of bodies towards the centre of the earth.

That part of mechanics which considers the motion of bodies arising from gravity, is peculiarly called *statics*.

Gravity, in this view, is distinguished into *absolute*, and *relative*.

The former is that with which a body descends freely through an unresisting medium: the laws of which see under DESCENT of bodies, ACCELERATION, MOTION, *Inclined PLANE*, &c.

The latter is that with which a body descends after having spent part of its weight in overcoming some resistance. Such is that with which a body descends along an inclined plane, where some part is employed in overcoming the resistance, or friction of the plane. The laws of relative gravity, see under *inclined PLANE*, DESCENT, FLUID, RESISTANCE, &c.

GRAVITY, *Centre of*. See CENTER of gravity.

GRAVITY, *Diameter of*. See DIAMETER of gravity.

GRAVITY, *Paracentric solicitation of*. See PARACENTRIC.

GRAVITY, *Plane of*. See PLANE of gravity.

GRAVITY, *Retardation from*. See RETARDATION.

GRAVITY of the air. See WEIGHT of the Air, AIR and ATMOSPHERE.

GRAVITY, in *Music*, is an affection of sound by which it becomes denominated *grave*, low, or flat.

Gravity stands in opposition to *acuteness*, which is that affection of sound by which it is denominated *acute*, *sharp*, or *high*.

The relation of gravity and acuteness, is the principal property on which music depends; and it is the distinct, fixed, and determinate quality of this relation which entitles sound to the denomination of *melodious*, *harmonical*, or *musical*.

Gravity is, therefore, that modification of sound by which it is considered as *grave* or low, with respect to, or compared with, other sounds, that are acute or high. See ACUTE.

The degrees of gravity, &c. depend on the nature of the sonorous body itself, and the particular figure and quantity thereof: though, in some cases, they likewise depend on the part of the body where it is struck. Thus, *e. gr.* the sounds of two bells of different metals, and the same shape and dimensions, being struck in the same place, will differ as to acuteness and gravity; and two bells of the same metal will differ in acuteness, if they differ in shape or magnitude, or be struck in different parts.

So in chords, all other things being equal, if they differ either in matter, or dimension, or tension, they will also differ in gravity.

Thus again, the sound of a piece of gold is much graver than that of a piece of silver of the same shape and dimensions; and in this case the tones are, *ceteris paribus*, proportional to the specific gravities: so a solid sphere of brass, two feet in diameter, will sound graver than another of one foot diameter; and here the tones are proportional to the quantities of matter, or the absolute weights.

But it must be observed, that acuteness and gravity, as also loudness and lowness, are but relative things. We commonly call a sound *acute* and low, in respect to another which is *grave*, or low with respect to the former; so that the same sound may be both *grave* and *acute*, and also low and high, in different comparisons.

The degrees of acuteness and gravity make the different tones or tunes, of voice, or sound; so we say one sound is in tune with another, when they are in the same degree of gravity.

The immediate cause or means of this diversity of tones lies very deep. Mathematicians express the proportion of sound to sound, by the ratio of numbers. The more we fix it on the different velocity of the vibrations of the sonorous body: in which sense gravity may be defined, a relative property of sound, which, with respect to some other, is the effect of a lesser number of vibrations accomplished in the same time, or of vibrations of a longer duration. In which sense also, acuteness is the effect of a greater number of vibrations, or vibrations of a shorter duration.

If the vibrations be isochronous, the sound is called musical, and is said to continue at the same pitch. See CHORD and STRING, in *Music*.

If two or more sounds be compared in the relation of gravity, &c. they are either *equal*, or *unequal*, in the degree of tune. Such as are *equal*, or produced by isochronous vibrations, are called *unisons*.

The *unequal* including, as it were, a distance between each other, constitute that we call an interval in music; which is properly the difference, in point of gravity, between two sounds.

Upon this inequality, or difference, does the whole effect depend; and in respect of this it is, that these intervals are divided into *conords* and *discord*s. See HARMONICS and RATIO.

As the gravity of sounds depends on the thickness, length, and tension, of the strings, or on the length and diameter of the pipes, and, in general, on the volume or mass of the sonorous bodies; the increase of any of these qualities (except tension) augments the gravity of sound. But there is no absolute point of gravity in nature, and no sound is *grave* or acute, but by comparison.

GRAULKETT, in *Geography*, a town of France, in the department of the Tarn, and chief place of a canton, in the district of Lavaur; nine miles N. E. of Lavaur. The place contains 3419, and the canton 7159 inhabitants, on a territory of 135 kilometres, in six communes.

GRAUN, CHARLES HENRY, in *Biography*, chapel-master to Frederic II. the late king of Prussia, was the favourite composer of that prince, from 1732 to the time of his decease, in 1759. On the accession of the prince of Prussia to the throne in 1740, his majesty, having determined to have an Italian lyric theatre in his capital, sent Graun to Italy to study the Italian language and taste the manner to engage vocal performers. Graun remained in Italy, during which time the king, his royal master, had constructed, in spite of the Silesian war, one of the most magnificent, complete, and convenient theatres in Europe, for which Graun was the composer to the end of his life; and even after his decease little music but of his composition was ever performed in it for a long time.

The works of this master are very numerous; before his arrival at Berlin, he set three or four operas in the German language at Brunswick, but the words were bad, and it is not fair to judge of his genius by these early productions.

He composed for the Berlin theatre, in the space of fourteen years, from 1742 to 1756, twenty-seven Italian operas:

and for the church, a *Te Deum*, and a *Passione*, besides miscellaneous productions of less importance, as odes and cantatas, with the overture and recitatives of the pastoral opera of Galatea, of which his majesty, Quantz, and Nichelman, set the songs.

On the decease of this excellent composer, innumerable poems and panegyrics were written to his memory. Among the "Critical Letters concerning Music," published by M. Marpurg, there is an address to M. Fried. Wilhelm Zachariä, the celebrated poet and musician of Brunswick, recommending the death of Graun to his muse. No great stress can be laid on panegyrics; however, there are few of Graun's admirers, who are not ready to burn with fire and faggot all those who dare to doubt of this author's veracity.

"Graun, the brightest ornament of the German muse, the noble master of sweet melody, is now no more! creator of his own taste, he spoke not, but to our hearts; tender, soft, compassionate, elevated, pompous, and terrible, by turns;—he could force tears of admiration from us, at his pleasure; an artist, who made no other use of art, than to imitate nature, in the most pleasing and expressive manner; each stroke of his pencil was equally perfect, full of invention, and of new ideas, his genius was inexhaustible. The model of sacred music, and in the theatre inimitable! a man who commanded our affections, not only by his talents, but by his virtues, of friendship, probity, and patriotism; no man was ever so universally lamented by the whole nation, from the king, to the lowest of his subjects." *Britische Briefe über die Tonkunst*. I. Band. Berlin 1760.

Now, to reverse the medal; it is denied, by the other party, that Graun was the creator of his own taste, which is the taste of Vinci; they deny, that he is ever pompous or terrible, but say, that an even tenor runs through all his works, which never reach the sublime, though the tender and graceful are frequently found in them; they are equally unwilling to subscribe to his great invention, or the originality of his ideas; and think that still more perfect models of sacred music may be found in the chorusses of Handel, and the airs and duos of Pergolesi and Jomelli: nor can they well comprehend, how that composer can be called *inimitable*, who is himself an *imitator*.

We have recently examined the scores of Graun's operas, and see no reason for changing the opinion which we formed 30 years ago. He was certainly a great master, elegant in his melodies, and correct and regular in his harmony; but if any one of his operas were now to be revived, it would be thought in want of variety and fire.

During the life of his great and illustrious patron, he was revered as much at Berlin as Handel in England; both great men, most assuredly; but much discrimination is necessary in drawing a parallel between them. Handel formed his style on the best models of the old school, at the time of its greatest perfection; such as Carissimi, Colonna, Aless. Scarlatti, Steffani and Corelli; Graun on that of the inventor of the new style, Vinci; who, though extremely and justly admired for the grace and elegance of his melodies, the simplicity of his accompaniment, and the facility and clearness of his style in general, has been far surpassed by Pergolesi, Jomelli, Piccini, Sacchini, and Paisiello. Germany is perhaps more obliged to Graun for smoothing, simplifying, and polishing the rough, laboured, and inelegant style of their old masters, than to any Italians that have been employed at the imperial court or at Dresden, to set the dramas of Apollonia Zeno and Metastasio. Handel had more spirit and invention, and Graun more polish and refinement. Handel was wholly unrivalled in the country where

he spent the greatest part of his life; but Graun had a rival in the Roman Catholic courts, in the celebrated Haffe, his countryman, whose compositions were as much in circulation and favour all over Europe, as those of Vinci and Pergolesi. Those of Graun seem wholly confined to Germany, and almost to the court of Berlin; nor do we ever remember to have heard Mara sing one of his airs in England, though during many years she performed the principal female parts in his operas at Berlin. His *Te Deum* was first appointed to be performed at the concert of ancient music in 1786, by the late duke of Leeds, then marquis of Caermarthen, and it has continued a stock piece ever since. Many of his duets, and his *Tod Jesu* are admirable compositions, and he certainly deserves to be ranked very high among the great masters of the last century.

GRAUN, JOHN GOTTLIB, brother of the above composer, and concert-master to his late Prussian majesty, Frederick II. his admirers at Berlin, say that "he was one of the greatest performers on the violin of his time, and most assuredly, a composer of the first rank; his overtures and symphonies are majestic, and his concertos are master-pieces, particularly those for two violins, in which he has united the most agreeable melody with all the learning that the art of counterpoint can boast; he has likewise frequently set the *Sa'ez Regina*, and composed masses, which are rendered grand and noble by simplicity and good melody, even in the most laboured parts."

But less quarter is granted to this master, by the admirers of more modern music, than to his brother; they often find his overtures and symphonies too like those of Lulli, and too full of notes to produce any other effect, when played at Berlin, than that of stunning the hearers: and in his concertos and church music, when that is not the case, the length of each movement is more immoderate, than Christian patience can endure.

Perhaps the truth may lie between these two opinions; and with respect to the chapel-master Graun, it should be remembered, that he was seldom allowed to follow the bent of his own genius.

GRAUNT, JOHN, born April 24, 1620, was brought up to the trade of a haberdasher, but by his good sense and integrity in business he acquired the esteem of his fellow citizens, so as to be elected into the common council of the city of London. The bills of mortality, which were annually laid before this body, led Mr. Graunt to turn his attention to the science of political arithmetic. From very small beginnings he collected a large body of materials, from which he composed a work entitled "Natural and Political Observations made upon the Bills of Mortality." This work was well received by the public, and passed through several editions: it obtained likewise for the author an admission into the Royal Society, upon the particular recommendation of the king, who gave it in particular charge to those concerned, that if they found any more such tradesmen, they should be sure to admit them all. It is generally supposed that Mr. Graunt received valuable assistance from sir W. Petty; but the style is such as might be expected from a plain citizen, and the tabular form, presenting at one view the general results of a number of important facts, was a thought essentially leading to all the conclusions which have since been established relative to these subjects. After he retired from business, he was admitted a trustee for sir William Baeckhouse, into the management of the New River Company, which, with the unlucky circumstance of his being a convert to popery, gave occasion to the groundless calumny of his having had a hand in the great fire of London.

The



The story, though given by Burnet, is abundantly refuted by the writers of the *Biographia Britannica*. Mr. Graunt continued his application to his studies, and made large additions to his "Observations" but two years before his death, which happened on the 18th of April, 1674. He was buried at St. Dunstan's West, and many of the most eminent and ingenious persons of that time, among whom was Sir William Petty, paid their last respects to his memory. He left behind him a discourse upon the advance of the excise, and some papers on religious topics, which have not been published. It must be mentioned to his honour, that immediately after the publication of his book, Lewis XIV. or his ministers, enacted a law to enforce the most exact register of births and burials that was to be found any where in Europe. *Biog. Brit.*

**GRAUPEN**, a term used by the German miners to express the residuum of any ore after the regulus, or metalline part, is run from it. Thus the ores of bismuth leave behind them, after the regulus is melted off, an earthy substance, called bismuth graupen, with which, mixed with blints and an alkali, they make a kind of smalt, not distinguishable from the true smalt made from cobalt. *Phil. Trans. N. 390.*

**GRAUSTONE.** See *GREYSTONE*.

**GRAUWACKE.** See *Transition Rocks*.

**GRAY, THOMAS**, in *Biography*, a distinguished English poet, descended from very respectable citizens of London, was born in Cornhill, December the 26th, 1716. His grandfather was a considerable merchant; but his father, Mr. Philip Gray, was of an indolent and reserved temper; and therefore diminished rather than increased his paternal fortune. He had many children, of whom Thomas, the subject of these memoirs, was the fifth: all of them except himself died in their infancy, and he is said to have narrowly escaped suffocation, owing to a too great fullness of blood, which destroyed the rest, and he would certainly have been cut off as early, had not his mother, with a courage remarkable for one of her sex, ventured to open a vein with her own hand, which instantly removed the paroxysm. He was probably destined for a profession, and accordingly sent to Eton school to acquire the fundamental stock of classical literature. Here he was placed under the immediate care of Mr. Antrobus, his mother's brother, at that time one of the assistant masters, and likewise a fellow of St Peter's college, Cambridge, to which place Mr. Gray removed, and was admitted a pensioner in the year 1734. Of his residence at Cambridge few memorials are recorded; he seems rather to have cultivated a literary taste in silence, than to have had any aim at public distinction. He nevertheless appeared as a poet among the university congratulators of the prince of Wales's marriage, and his verses were admitted to be the best of the poetical collection. His letters, during this period, to Mr. West, which are printed by Mr. Mason, shew that he had little reverence for the graver studies, or for the dignified personages of the place, and that he had acquired that classic fastidiousness which was the permanent feature in his character. He quitted college in 1738, and occupied a set of chambers in the Inner Temple, with the avowed intention of studying the law. A Latin ode, addressed upon this occasion to Mr. West, who had the same purpose in view, exhibits in a striking manner the ascendancy which the poet possessed in his mind over the ideal lawyer; and on the invitation which Mr. Walpole gave him to be the companion of his travels, he laid aside this intention, and never after resumed it. They set out in the spring, and his letters from the different stages of his progress, are a proof of the intelligent curiosity with which he viewed all the striking objects of art and nature, and the manners and habits of mankind. Thus, in his letter from

Amiens, he describes every thing that he saw on the road, paints in vivid colours what was remarkable in the several towns through which he passed; and he adds, that when every hill-top is a windmill, a crucifix, or a Virgin Mary dressed in flowers, and a river a robe; and when every people or carriages on the road; now and then a selling friar, a countryman with a great staff, and a man riding astride on a little ass, with short peltic and a great head-dress of blue wool." They travelled through France, crossed the Alps, visited the principal towns of Italy as far as Naples, returned to Florence, and in the spring of 1741 proceeded for Venice. Upon their way through the two companions fell into a disagreement, which occasioned their separation. Of this unfortunate incident the biographer says, "Mr. Walpole enjoins me to charge Mr. Gray with the chief blame in their quarrel; confiding that his magnanimity and complaisance, more deference to a variety of dispatch, superior judgment and prudence, might have prevented a rupture that gave much uneasiness to them both, and a lasting concern to the survivor; though, in the year 1742, a reconciliation was effected between them." Mr. Gray, with his own very moderate resources, soured the rest of the tour, and arrived in England in September 1741, two months previously to the death of his father. He now returned to academic retirement at Cambridge. In the following year he had the misfortune to lose his friend Mr. West, the confident of his sentiments and partner of his studies. The death of this hopeful young man left a vacancy in Mr. Gray's heart, which was never after supplied. He had an ambition to excel in Latin poetry, but was convinced that lasting fame could only be acquired by works accordant to the general taste of his countrymen. He made many noble beginnings of poems, which, if he had possessed perseverance enough to have completed them, would have redounded to his immortal honour. In the year 1742, he took the degree of bachelor of civil law, a circumstance which gave him every necessary privilege for pursuing an university residence, and he sat down to a course of reading, which he pursued with the diligence of an exact critic. For several years his exquisite learning and high poetic talents were known to but a very few of his most intimate friends. In 1747 he published his "Ode on the distant Prospect of Eton College;" and in 1751 his "Elegy written in a Country Church-yard," was sent into the world without the author's name. Few poems were ever so popular; it has passed through an almost indefinite number of editions, and is at this moment one of the most favourite productions of the British muse. It has been translated into Latin and Greek verse. In 1753 Gray buried his mother, to whom he had always behaved with true filial duty and affection, and on her tomb he wrote, "the tender mother of many children, one of whom alone had the misfortune to survive her." At college he was, on account of some peculiarity in his manners, subject to the boisterous tricks of a few riotous young men of fortune, who took a pleasure in disturbing and alienating him; he made remonstrances on the subject to the head of the house, which not producing the effect which he anticipated, he removed his residence to Pembroke Hall in 1756, and in the succeeding year he was, on the death of Cibber, offered the post of poet laureat, which he declined. His motive for refusing this office could not have been through any doubt of his being adequate to its duties, for in the same year he shewed what he was capable of doing as a lyric poet by the publication of his two principal odes, entitled "On the Progress of Poetry;" and "The Bard." It would indeed have been most lamentable that a man of his genius and independent mind should have been fettered by the obli-

gation of producing periodical oblations of court incense. The odes just mentioned were much less popular than the elegy: many could not understand them, some ridiculed them, and in general they were more the objects of astonishment than of rapturous feeling; nevertheless, among persons of real literary taste, they raised the author's poetical character to a level with that of the first poets of his country. In the year 1759, Mr. Gray varied the uniformity of his life by a residence, which continued three years, in lodgings near the British Museum, chiefly for the purpose of consulting curious books and manuscripts in that great national repository. In 1765 he took a journey into Scotland for his health, was introduced to the most eminent literati in that country, and fed his imagination with those scenes of natural sublimity and beauty which no man was better qualified to taste, and to improve. He had, previously to this, fought for the professorship of modern history at Cambridge, but either his application was too late, or the patron, lord Bute, had other interests to serve; it was given to another candidate. A second vacancy occurred in 1768, when it was conferred upon him, unsolicited and unexpected, in the most handsome way possible, by the duke of Grafton, who, notwithstanding some defects in the former part of his life, has always been capable of doing noble things in a noble manner. The place was worth 400*l. per ann.* and Gray made a voluntary return for the favour by an "Ode to Music," for the installation of that nobleman, as chancellor of the university in 1769. His new office laid him under an obligation to some exertions: he might indeed have sheltered himself by the example of his predecessors, and received the emoluments without paying any regard to its duties, but the idea of retaining a perfect sinecure did not accord with his temper; he immediately set about preparing for active service, he sketched an admirable plan for his inauguration speech, in which, after enumerating the preparatory and auxiliary studies requisite, as ancient history, geography, chronology, &c. he descended to the authentic sources of the science, such as public treaties; state records, private correspondence of ambassadors, &c. He also drew up and laid before the duke of Grafton, three different schemes for regulating the method of choosing pupils privately to be instructed by him, which were highly approved, and if he had been accustomed, by general habits, to those exercises which he felt would have been beneficial to the improvement of his pupils, much might have been expected from his lectures, but with a mind replete with the stores of knowledge, ancient and modern, he was totally unable, through the baneful effects of habitual literary indolence, to bring his vast acquisitions to use on demand; and after many uneasy struggles, he proceeded no farther than to sketch out a plan. His health was indeed rapidly on the decline; low spirits, "the indolent scholar's familiar malady," seized him; an irregular hereditary gout made more frequent attacks than usual on his feeble constitution: at length a sudden nausea, with which he was affected while dining in the College Hall, indicated that the disease had left the extremities and established itself in the stomach. He died July 30th 1771, in the fifty-fifth year of his age. He was sensible to the last, and aware, through the whole of the disease, of his great danger, but expressed no visible concern at the thoughts of his approaching dissolution. With a warm imagination, Mr. Gray had cool affections, and a calm sedate disposition. He was attentive from economy, yet wholly void of avarice: he was generous, even when his circumstances were the most narrow. He was careful of himself, and so timorous, that it is asserted, some of the finest views in a tour to the Lakes escaped him, because he did not choose to venture to those

spots whence they were to be seen. This want of personal courage is a singular contrast with the manly and martial strains of his poetry. In morals he was temperate, upright, and a constant friend to virtue. His religious opinions were not known, but he always abhorred the dissemination of scepticism and infidelity. Few men of his reputation have had less vanity, and he bore with good-humour and easy negligence all the criticisms upon his compositions. The learning of our poet was general and deep: it comprised almost every topic of human enquiry, excepting what belonged to the sciences properly so called. As a poet his name must descend to the latest posterity, at least, as long as there is taste enough left to feel and enjoy elegant writing. No one appears to have possessed more of that faculty of poetical perception which distinguishes among all the objects of art and nature what are fittest for the poet's use, together with the power of displaying them in their richest colours. According to a critic, Mr. Gray "did not excel in pure invention, neither is he highly pathetic or sublime, but he is splendid, lofty, and energetic; generally correct, and richly harmonious. Though lyric poetry is that in which he has chiefly exercised himself, he was capable of varying his manner to suit any species of composition. Perhaps he was best of all qualified for the moral and didactic, if we may judge from his noble fragment of "An Essay on the Alliance of Education and Government." As a writer of Latin verse he is perhaps surpassed by few in classic propriety. His letters are entertaining and instructive; free from all parade; they possess a fund of pleasantry, which will ever render them popular among those of his countrymen, who are at all imbued with the principles of literary taste. By a friend who has described his character it is said that "perhaps he was the most learned man in Europe; he was equally acquainted with the elegant and profound parts of science, and that not superficially but thoroughly. He knew every branch of history both natural and civil, and had read all the original historians of England, France, and Italy; and was a great antiquarian. Criticism, metaphysics, morals, and politics, made a principal part of his plan of study; voyages and travels of all sorts were his favourite amusement, and he had a fine taste in painting, prints, architecture, and gardening: with such a fund of knowledge, his conversation must have been equally instructive and entertaining; but he was also a good man, a well bred man, a man of virtue and humanity. There is no character without some speck, some imperfection; and I think the greatest defect in his, was an affectation in delicacy, or rather effeminacy, and a visible fastidiousness or contempt and disdain of his inferiors in science. He also had in some degree that weakness which disgusted Voltaire so much in Mr. Congreve; though he seemed to value others chiefly according to the progress they had made in knowledge, yet he could not bear to be considered himself merely as a man of letters; and though without birth, or fortune, or station, his desire was to be looked upon as a private independent gentleman." *Mason's Life and Letters of Gray*, four vols. 8vo. 1778.

GRAY, or *Grey*, a mixed colour, partaking of the two extremes, black and white. In dyeing, many of the varieties of grey, iron-grey, slate colour, &c. are given by processes, in general, similar to those for black, but with smaller quantities of the ingredients, and especially a shorter time of immersion. They are often finished with a weak bath of weld, cochineal, Brazil-wood, and other livelier colours to give some particular tints.

In the *Mauve* they make several sorts of grays: as the *Iron'd* or *black'd* gray, which has spots quite black, dispersed here and there. The *clapp'd* gray, which has spots

of a darker colour than the rest of the body. The *light or silver gray*, wherein there is but a small mixture of black hairs. The *red or iron gray*, which has but a small mixture of white. And the *brownish or sandy-coloured gray*, where there are bay-coloured hairs mixed with the black.

GRAY, in *Zoology*, a name given in some counties of England to the badger.

GRAY is also used in some places for a species of wild-duck, more commonly known by the name of the *gadwall*. See DUCK.

GRAY, in *Geography*, a town of France, and principal place of a district, in the department of the Upper Saône, seated on the Saône, which is navigable by boats to Lyons, whither the inhabitants send grain and iron, the chief articles of their commerce. The place contains 5009, and the canton 13,825 inhabitants, on a territory of 215 kilometres, in 26 communes. N. lat. 47° 27'. E. long. 53° 40'.

GRAY, a post-town of America, in Cumberland county and state of Maine; 15 miles N.W. from Portland. The township was incorporated in 1778, and contains 987 inhabitants.

GRAY'S Bay, a bay on the N. side of the river Columbia, in New Georgia. N. lat. 46° 19'. W. long. 236° 22'.

GRAY'S Creek, a river of Virginia, which runs into James river. N. lat. 37° 8'. W. long. 76° 56'.

GRAY'S Harbour, a port or bay on the W. coast of North America, examined and described by Mr. Whitbey. The surrounding shores are low and apparently swampy, with salt-marshes; the soil is a thin mixture of red and white sand over a bed of stones and pebbles. At a small distance from the water side, the country is covered with wood, chiefly pines of an inferior stunted growth. The number of Indians inhabiting this place were estimated at about 100; they spoke the Nootka language, though it did not seem to be their native tongue, and they appeared to vary in little or no respect from those people occasionally seen. N. lat. 47° E. long. 236° 7'.

GRAYLING, or UMBER, the English name for the fish called by authors *thymallus*, and *thymus*, and by Artedi made a species of *corregonus*, and the *SALMO thymallus* of Linnæus, which see.

It is caught in the fresh rivers and clear rapid streams, chiefly in the mountainous counties of England, and in the like situations in Germany, and other kingdoms, and is one of the finest tasted of all the fresh-water fish. It is common in Lapland, where the guts of it are used instead of rennet to make cheese, which they get from the milk of the reindeer. It is a voracious fish, rises freely to the fly, and will very eagerly take a bait. It feeds on worms, and spawns in May.

GRAYSON, in *Geography*, a county of Virginia in the upper waters of the Great Kanhawa. It contains 2742 free inhabitants, and 170 slaves. Its form is triangular; the longest line being about 50 miles, and its greatest breadth 15 miles. It is mountainous, abounding with timber and iron ore; and two sets of iron-works are erected in it: about a fifth part is arable. The court house is in N. lat. 36° 35', 250 miles S.W. of Richmond.

GRAZALEMA, a town of Spain, about 14 miles from the borders of the province of Granada, built partly on the side, and partly on the top of a mountain. Most of the inhabitants are employed in the manufacture of woollen and coarse cloths, and also of crucibles. Their number is about 5000.

GRAZIANI, ANTON-MARIA, in *Biography*, a bishop and elegant writer, was born of a distinguished family at

Borgo-San-Sepolcro, in Tuscany, about the year 1517. Having obtained a good knowledge of grammatical learning at Fiesole under the celebrated Abbotino, he went to Padua to study the law. In 1560 he visited Rome, and was kindly patronized by Commendon, afterwards cardinal. He accompanied this friend, between whom and himself there was an unalterable attachment, in all his journeys into Germany and Poland, and refused to quit him, though solicited with great promises by Henry of Valois, at that time king of the latter country. After the death of Commendon done in 1584, he was made secretary to pope Sixtus V., and took a considerable share in the election of Clement VIII. who, in 1592, in gratitude for his services, created him bishop of Amelia, and sent him as his nuncio to the Italian princes and states, in order to unite them in a league against the Turks. When at Venice, he prevented that republic from declaring in favour of Cesar d'Este after the demise of Alphonso II. duke of Ferrara. In 1598 he retired to his see, where he remained, till his death in 1611, most assiduously employed in the duties of his high office. As an author Graziani is known by the following works: "De Bello Cyprio," lib. v. 4to. 1624; "A History of the War of Cyprus;" "De Vita Commendonii, Cardinalis," which was intended as a tribute of gratitude and affection to his deceased friend and patron; "De Casibus adversis Virorum illustrium," and a collection of synodal ordinances. In 1745 the public were presented with a curious posthumous work of this author, entitled "De Scriptis Invita Minerva, ad Aloysium Fratrem," lib. xv. in which he not only gives an account of his own life and writings, but that of his native town and family; of his brother's travels, and of the public affairs in which he was engaged. Moreri.

GRAZIANI, D. BONIFACIO DA MARINO, maestro di capella of the Jesuits' chapel and seminary at Rome, was a very voluminous composer of sacred music and cantatas, who flourished from the year 1650 to 1678. Padre Martini has given the following list of his ecclesiastical publications: three books of psalms for five voices, *a due cori*, or for two choirs; published at Rome 1652 and 1670. Masses 35 Rome, 1671. Six books of motets, for 1, 2, 3, 4, 5 and 6 voices; Rome, from 1651 to 1671; antiphons, for the blessed virgin Mary, for 4, 5 and 6 voices, Rome, 1667. *Responso della Settimana Santa*, Rome, 1663. *Litani*, for 3, 4, 5, and 8 voices, Rome 1675. Sacred and moral compositions, for 1, 2, 3 and 4 voices, 1678. Of his cantatas, though none are mentioned in this list, yet the number of them, that have been preserved in MS. collections of old music, is equal to those of Carissimi, Corelli, and Luigi Rossi, particularly in the British Museum; Dr. Aldridge's collection of music in the library of Christ-church, Oxford; Dr. Burney's Collect. &c.

GRAZIER, in *Agriculture*, a term commonly applied to such farmers as are engaged in the art and business of fattening various sorts of live stock on pasture and other grass-lands. That this sort of business may be managed to the best possible advantage, the grazier should have a perfect knowledge of the nature, properties, and value of all sorts of cattle and sheep dock, as well as of the quality of the ground on which they are to be fed, and of the most proper methods of fattening them to each other. And he should also be well informed concerning the nature and states of markets in general. It is obvious that upon these being well understood and properly regarded, much of the success of this sort of farming business must depend, as thereby proper advantage may be taken not only of fairs and markets, but a variety of other necessary circumstances.

The markets for the sale of fat stock, especially those of the neat cattle and sheep kinds, are generally as high about the end of April as at any other period of the year, in consequence of the supply, at that season of the year, being only had from cake or corn-fed animals, not one farmer in a thousand having then any sort of winter green food remaining. On this account such beasts or sheep as are really fat at that time are sure to fetch a good price in the markets, and particularly at Smithfield. With the latter animals, however, the case is, in some instances, rather different as to those farmers who are good providers: spring food is now beginning to be ready, though seldom in such plenty, from the number of bad managers, as to reduce the markets in any great degree.

The inexperienced grazier should consequently fully weigh and consider the different modes in which he may be able to dispose of his fat stock to the greatest advantage. The first and principal place to which his attention will be directed, will probably be Smithfield market, especially for the more southern graziers. If he be situated in a district that is divided into small or middling sized farms, and in which the farmers are commonly in the regular practice of employing district drovers, in whom proper confidence can be placed, he will of necessity be as safe as his neighbours, and may not have reason for any particular caution. This mode is very common in the eastern part of the county of Norfolk. Where he occupies a very large farm, whatever the nature of it may be, whether an arable grazing one, as is customary in West Norfolk, or a grass grazing one, as in the county of Lincoln, on a scale that enables him to send many droves in a pretty regular manner to his fileman, he may safely trust to him; as the usual confidence and integrity of trade mostly take place in such cases. But it must be observed, that it is seldom the case that the grazier who sends occasionally or accidentally a lot of fat beasts or sheep to Smithfield market, gets as fair a price for them as his great neighbour, who is in constant dealing, gets the same day, or his little one, whose stock took the same chance through the means of a confidential drover. The person who thus drops in a lot, out of the regular course of his business, is scarcely ever satisfied with the treatment he meets. And there is, without doubt, much truth in the remark, in consequence of the frequency of its being made by persons from different places.

On this account the inexperienced grazier should consider the circumstance well, and try the country butchers, in order to feel his way through the difficulty as well as he can, provided his farm be of such a size, and in such a situation, as to lay him open to its influence and effects.

In the business of grazing, great advantage may be derived, by those who have not had much experience, from the frequent weighing of the animals while alive; as by a comparison of the living with the dead weight, in such cases, as when they are killed in their own neighbourhoods, they may soon become able to judge, with a tolerable degree of correctness, of the dead weight of any common sized beast, of which they have ascertained the weight while in the living state. And where the living weight has been taken from tables of admeasurement, such as those composed by Bantor, they may compare the result in a pretty exact way.

The work of ascertaining the living weight in sheep, calves, hogs, and other similar kinds of animals, may be effected in a simple and easy manner, merely by the contrivance of a sort of cage or large covered basket, with a door at each end for their reception and discharges, to which is attached a pair of large scales; so as to shew the weight.

The frequent weighing of the fattening stock shews the grazier the different degrees of progress which the animals have made in different periods and situations, as well as what the effects of different sorts of food are upon them; what changes may be necessary in it, and when it may be the most proper to sell, provided the markets should be suitable. In short, a sort of confidence is in this way gained by the grazier, that could not be readily acquired in any other manner.

But assistance of this nature is not by any means necessary for such graziers as have been long accustomed to the handling and judging of the weights of animals, as they can in general form tolerably correct opinions by the eye and the feel, in consequence of such long experience; though it not unfrequently happens that they are deceived, the beasts turning much better and heavier than they had imagined. It has, indeed, been remarked that, let the grazier be as experienced as he may in buying and selling, as well as in judging by the hand and the eye, the butcher will beat him, from having been able to bring the live to the test of the dead weight, in such a variety of different instances, as must render his judgment perfect. The grazier, though he cannot therefore equal him, may, in a great measure, approximate to him by means of frequent careful weighing of the living animals.

It must of course appear evident that it is a matter of great consequence for the flock farmer, to make himself, as soon as possible, perfectly conversant with this part of his business, as without it he must be liable to be greatly deceived in his dealings.

GRAZING, the practice of feeding and pasturing down grass-lands with different sorts of live stock, with the intention of improving and rendering them fit for the market. It is a sort of management that cannot be carried on to much advantage, except in those districts where the quantity of pasture land is considerable, and of a suitable quality for the purpose, or where the value of the produce of such sward land is but small in comparison with the stock which is fed upon it.

There are particular districts in different parts of the kingdom that are much more in this system of farming than others, as is exemplified by those of the counties of Lincoln and Leicester, in the middle part of the island, Somerset, Gloucester, &c. in the west, and Romney marsh, &c. in the south.

But there are tracts of grazing ground of more or less extent in most of the counties of the kingdom.

It is well remarked that there are certain situations as well as descriptions of pasture ground on which this method of farming may be had recourse to with better profits, and more success than that of any branch of the dairying system: This must be the case in all those districts where the proportion of land in the state of tillage is very small in comparison to that of the pasture kind, consequently the price of produce of the grass sort trifling in comparison to that of the fat stock. In all such districts of the kingdom where the grass-lands are of so fine and rich a quality, as to be capable of fattening large bullocks or other cattle, this system may be had recourse to with much success and profit, and is perhaps the best application to which the lands can be applied, as is fully shewn by such districts being mostly under some management or other of this nature.

It may be observed that the art of grazing to advantage depends upon a variety of circumstances, such as those of the nature and quality of the grounds, the propriety of the management of them in respect to feeding down, changing, and shutting them up; the properly adapting the stock to them

## GRAZING.

them in quantity, size, and quality; the judgment of the grazier not only in selecting such as are most suitable for the purpose and most disposed to fatten, but in obtaining them, where they are to be purchased, at such prices as that they may pay well for keeping; and disposing of them, when fattened, at their full value and advantage.

It has been stated, by Mr. Kent, that the stocking of land with proper cattle is one of the nicest parts of the science of farming. Where nature is left to herself, she always produces animals suitable to her vegetation, from the smallest sheep on the Welsh mountains to the largest sort in the Lincolnshire marshes; from the little hardy bullock in the northern highlands to the noble ox in the richest pastures in Somersethire. But good husbandry admits of our increasing the value of the one in proportion to that of the other. Land improved enables us to keep a better sort of flock, which shews the double return the earth makes for any judicious attention or labour we bestow upon it. The true wisdom of the occupier is best shewn in preserving a due equilibrium between this improvement of his land and flock. They go hand in hand, and if he neglect the one, he cannot avail himself of the other. It should, therefore, be first considered what kind of cattle, or other sorts of flock, will answer the purpose best, on the particular description of land upon which they are to be grazed; and next, what sorts may pay the most in the consumption of the produce.

“In general, it will probably be found, that upon strong florid pastures of the driest kinds, the large sorts of cattle, with some of the larger breeds of sheep, will be the most suitable flock; but that where the grass-lands are neither so luxuriant nor so dry, and upon turnip-lands, the small English, Welsh, or Scotch cattle, with some of the small breeds of sheep, will be most profitable. Thus, as different sorts of grass-land and different kinds of produce seem in point of profit to require different descriptions of animals to feed upon and consume their produce, it is of much importance to be at some pains to make the best and most suitable application.” And in cases where the grazier breeds his own stock, he will have little difficulty in selecting such of the different kinds as are the most adapted to his views; but where the animals are to be purchased in, which must most frequently be the case, more care and circumspection will be necessary. It will be proper, though a difficult task, to make a choice of such as have been well kept and are in a thriving condition; as when they have been stunted in their food, and have the contrary appearance, they seldom do so well for the uses of the grazier. It will likewise be of advantage to have them from situations in which the lands are inferior in point of richness. It is noticed by some, that many farmers have found great advantage in buying sheep from the poorest spots, as they generally thrive most when they come into a richer pasture, like trees which endure transplanting the better for coming from a poor nursery. They likewise think that they endure folding and penning better than sheep which are bred on a more luxuriant soil. And they are certainly right, in these observations. But, with respect to the notion which farmers are apt to entertain, that all kinds of sheep will not endure penning, they labour under an error. It is believed that all lean or store-sheep are the better for being folded. They are generally more healthy; and, above all other advantages, this one is certainly obtained by it; when such sheep are put to fatten they thrive much better and faster, as oxen do that have been moderately worked. But where the grazing-lands are very moist, sheep are not by any means a sort of flock to be depended upon, as they are extremely liable to become diseased.

In addition to these points, it is necessary to have consider-

able regard to the qualities or properties of the kinds of animals, whatever they may be, in the intention of grazing them with profit; those kinds, whether of cattle or sheep, which have the property of keeping themselves fat, or in tolerably full condition, by the least consumption or expenditure of food, being constantly preferred, whatever the size or breed may be, as that is evidently a quality of much greater importance to the grazier than that of mere size, considered in an abstract manner. It is stated, that where there are fine and rich pastures, the grazier may “choose his beasts as large as he can find them, provided they are of the right breed and shape; but let him always prefer shape to size; for it will assuredly pay him better;” and, that “those who are upon indifferent grass must take care to proportion the size of their beasts to the goodness of their pastures: their cattle had much better be too small than too large; as there are vast tracts of land that will answer in grazing, which are not good enough to support large breeds.” And it is not improbable, but that the same thing may hold good in a great degree in regard to sheep. But in all such cases, as where the flock is reared upon the land of the farm, which is often a good practice, there can be little difficulty, as has been seen, in fixing upon such animals as are the most proper in these different intentions; but as it must often be necessary for the grazing farmer to purchase his live-stock at fairs and markets, and in other circumstances, much care and attention, as well as knowledge, will be required for him to accomplish it in the most advantageous manner.

In a system of Practical Agriculture, lately published, it is noticed to be “of great importance in this business to provide such as have been kept in a proper manner, and are in a healthy, improving state; as, where the contrary is the case, they are difficult, and require a much greater length of time to be brought into the state proper for sale than would otherwise have been necessary. It is, perhaps, experience alone that can qualify the grazier to form a correct judgment in these respects; in general, however, he is led to the choice of flock by no fixed or scientific principles, but by the impression the appearances of the animals have upon him.” And, it is stated on the authority of Mr. Marshall, “that the experienced grazier, who has been accustomed to attend fairs and markets, knows at sight, or by the assistance of the slightest touch, whether the animals he is about to purchase will suit him. Their general form and looks please him. They are every where clean; have little oil about them; their eyes are full and vivid; their countenances brisk; their skins alive, and their flesh mellow. On the whole, they have the resemblance of those which have been grazed before with success. Others are rejected, from the grazier not having found any such as they resemble to have done well, but many to have turned out in an unprofitable manner.” And the writer of the above work conceives, that there are certain “principles in this branch of the farmer’s business which may be attended to with great advantage, as the animals have certain points or parts, the proper or improper forms of which denote them to be valuable, or the contrary, for this purpose. These are, that the legs should be short in proportion to the size of the animal; the back very straight, broad, and flat; the loins wide; the carcass deep round, or rather barrel-shaped below; the fore-quarters round, full, and spreading; the bones small; the flesh affording an elastic feel; the situation, and a disposition to fatten well, and on the best parts. Where these marks are predominant, the flock is mostly suitable for the purposes of the graziers.” And, “that where the hair of the hide, in fattening cattle, is inclined to curl instead of

being straight, they are most disposed to thrive. This has been found to be the case in practice in different parts of the kingdom," as has been shewn in various publications on agriculture.

"In lean beasts also, when the hair of the hides is curled, they commonly keep themselves in better condition than where the contrary is the case. In all cases a disposition in the animals, of whatever sort they may be, to wildness, and not remaining quietly in their pastures, forms an insurmountable objection in this system of management; as no animal ever fattens well that has a tendency to ramble: it is quietness, feeding quickly, and lying much, that has the greatest tendency to make them become fat in a short time;" a fact which is fully confirmed by what happens in the new Leicester or Dishley breed of sheep, which are so tame and quiet as scarcely to move over a common gutter in the pasture. And, "from the result of actual experiment with four different beasts, in which the least possible difference could not be discovered on the most minute examination, it has been shewn that too much attention cannot be bestowed in the choice of the breed of fattening stock, as, though they were in every respect the same in appearance, two, from their superior disposition to fatten, were found to afford a profit in the proportion of fifteen shillings the week, while the other two did not yield more than about five shillings and ten-pence." This fact is recorded in the Annals of Agriculture, and clearly shews that too much attention cannot be paid by the grazing farmer to the discovery of this propensity in the stocking of his pasture, or other grass-lands.

Notwithstanding it must often happen that the grazier cannot fully avail himself of this, from the impossibility or vast difficulty of procuring such animals, and is consequently under the necessity of buying in such as are more at hand, and ready for his use.

It is the usual custom in Leicestershire, and the neighbouring districts, to have commonly recourse to the improved long-horned breed of cattle, from the animals being found to fatten in a ready manner, and to afford good beef. And, in the adjoining county of Lincolnshire, a mixture of the large sorts, of both the long and short-horned breed, are had recourse to as grazing stock, besides those bred in the county, and such as are brought into it by the Scotch drovers.

On the contrary, in Somersetshire, the dark-red sort, or Devonshire breed, has been long much in esteem by the graziers, and have lately spread themselves much into the midland districts, as Leicestershire, Oxfordshire, and Warwickshire, from the grazing farmers in these districts finding them to answer upon their pastures more perfectly. And in Suffex, the same breed is also held in considerable estimation by the farmers, as well as their own variety of it, as they are both found to fatten kindly, and with considerable expedition, upon their lands, and to have a ready sale in their markets and fairs.

However, in the more arable or tillage districts of Norfolk and Suffolk, where turnips and artificial grasses are more in use, the Kiloe, Galloway, and other small Scotch breeds, as well as those of the Welsh runt kind, are in preferable demand, from their answering better on these sorts of food, their more kindly disposition to fatten, and the excellent quality of their flesh, which never fails to have a ready sale in the London market, where the greatest part of their fat stock is sold. But the grazing farmers in the northern counties have mostly recourse to their own long-horned breed, raised on the farms, with the different Scotch breeds brought into the districts, their home sort being in their experience the

least disposed to take on fat and become saleable. And the large Hereford sort, as well as that kind of Welsh cattle termed the Glamorgan, are also very advantageous grazing stock in situations where the pastures are good, and they can be finished with other sorts of food. Great numbers of the former of these sorts are purchased by the graziers round the metropolis for being fattened or brought considerably forward on the rich grass lands, which have been mown for hay, and finished with other sorts of food. Yet the small breeds of the Scotch, Welsh, or other similar kinds, may, in many cases of the inferior sorts of grazing lands, often be the most beneficial in affording profit to the farmer, as he can suit them more to the nature and state of such lands, and they have more chance of becoming fat upon them. Indeed it has been stated in the tenth volume of the Bath Papers, on the experience of fifteen years, that the small animal has generally "a more natural disposition to fatten, and requires (proportionably to the large animal) less food to make it fat; consequently the greater quantity of meat for consumption can be made per acre." If this point was satisfactorily proved, there could be no doubt of small animals being preferable both on this description of grazing land, and that of a better quality; but, as an able and accurate observer has upon much experience been induced to think differently on this subject, the grazier should be cautious how he has recourse to small breeds upon lands that are capable of fattening large ones, until the question has been fully decided.

In respect to what relates to the sort of cattle that may be employed to the greatest advantage under this system, oxen, and such heifers as have been spayed, are in general considered, by the best informed graziers, as the best sort of stock; as besides being more quiet, the latter have not only the property of fattening in a more expeditious manner, but with a less consumption of food. They are not, however, so readily provided by the grazier. The ox is of course the most commonly, as well as most extensively, employed for the purpose of the grazier, as having the advantage of being capable of being fattened, and of affording good beef, after he has been beneficially wrought in the team of the farmer. Cows, under different circumstances, are likewise often bought in by the grazing farmer for the purpose of being made fat, such as those that have become dry, have slipped the calf at an early period, or are becoming aged; but much caution is necessary in the purchase of this sort of grazing stock, as they frequently turn out less favourably than bullocks or heifers, though in some cases they leave a good profit. When old, they rarely thrive well or get fat with any degree of expedition. Indeed it is, perhaps, the best way, in all cases, for the grazier to have such stock as is not too far advanced in age, as young animals are invariably more disposed to get flesh, and become fat, than such as are old. In the grazing of both heifers and cows, they should be suffered to take the bull as soon as they have an inclination, and be ready for being sold off fat several months before the time they would have calved. Such cow or heifer stock as are in calf, may sometimes be purchased in at a cheap rate in the fairs in the autumnal season, and be fattened off in the early spring with a good profit. There is likewise another description of this sort of stock sometimes grazed, which is what are termed *free martins*, or cows that are barren; but they are said to seldom answer in this intention in any very advantageous manner.

In relation to the most proper sheep stock for the grazier, when the pastures are rich, and afford full keep, the improved, large long-woolled breeds, as the new Leicesters, may yield the



the best profit; but where the lands are less rich, and the feed of course less plentiful, the small, improved, short-wooled breeds, as the South Downs, may leave a more ample profit to the farmer. Where wethers of the former kind can be procured, they mostly turn out well for the purpose. And in the contrary circumstances, perhaps the South Downs cannot be excelled by any of the short, or middle-wooled breeds. But in particular situations and circumstances of grafs-lands, many other breeds may, however, be more profitable to the grazing farmer. It is stated, in the Agricultural Survey of Somersetshire, that the Dorsets, formerly so prevalent in that district, have lately given way to the polled, native breed of the lower part of the county; from the circumstances of their giving a larger proportion of wool, and their fattening more expeditiously, and at the same time more fully, especially on the internal parts. However, in the rich marshes in the southern parts of the island, the grazing farmers, who are mostly in extensive business, have constantly recourse to the polled, white-faced breed, and that of the South Down, which they find the most profitable forts on their lands that can be employed.

In the northern parts of the kingdom, the graziers have principally recourse to the native breeds, the heath and Cheviot forts, and find the former the quickest in getting fat, and the most hardy in their nature. The Cheviot fort seems, however, lately to have gained ground in the more elevated and hilly situations.

Whatever the breeds of the animals may be that are made use of as grazing stock, it has been found, from long experience, that it is a matter of much importance to procure them from districts, where the quality of the land is inferior to that on which they are to be fattened, as by such means they not only get fat in a more expeditious manner, but without suffering any check upon being first turned upon the pastures.

It is a matter of much consequence in sheep grazing that they have a fine close pasture; and that they be prevented from going upon such grafs-lands as have been covered by water, and become sandy, as under such circumstances, they are liable to become diseased. And, besides this, it may be beneficial in many cases for the farmer to be careful that horses are not turned upon the pastures along with them, as it has been found that the tufts of long, rank grafs that rise about the dung-heaps, are apt to render them in a state of disease, except where frost has taken place, when the danger is for the most part removed; and it is supposed, that it is also dangerous to suffer sheep to browse upon the grain, especially that of barley, which shoots up among the stubble, after the harvest is completed; and fallows that are wet and unsound are equally detrimental, whether the soil be *light* or *strong*. In the former situations, they frequently pull up the herbs by the roots, which they eat with the dirt adhering to them, which will inevitably give them the rot; and, if the fallows be strong land, and should not afford a sufficient supply of food, they are liable to the hunger-rot, from being compelled to eat the rank, unwholesome vegetables produced on such grounds, especially the lesser spear-wort, and the marsh-penny-wort, both of which plants flourish in wet situations, and ought carefully to be eradicated wherever they are found. It is further advised, that in turning sheep into pastures, particularly water-meadows, and also into those places that are subject to rot, to pursue the same precaution as with neat-cattle; which is previously to satisfy the craving of appetite, by giving them hay or cut straw, and after the dew has been evaporated by the rays of the sun, to drive them gently round the field for two or three hours before they are suffered to eat. But, whenever any sort of dry

food is given, they ought to be supplied with *fresh water*, particularly during the winter, lest they actually perish in the summer months, and which ought to be done, not only as a stubble, but that they may be able to stand the winter, always to be preferred, and which can be obtained in the plain general, whatever province, hills, or mountains, and the necessity of the water being constantly supplied, and charged with the juice of the grass, and the water being then well-watered in troughs, or tubs, &c. This is particularly attended to in the mountains of the Alps, where they are confined there by the great quantity of snow, which has been noticed, that "the watering of the sheep on the Continent, regarded as a circumstance of the greatest importance, and accordingly receives that attention which it deserves." Thus, in Sweden, and at the national farm at Rindö, in the France, they are daily watered with running-water, or with that obtained from lakes or springs, *if great water being not properly and rigorously prohibited*. In some of the *Swiss* sheep-farms, the sheep are watered in the cots or folds during the winter, instead of taking them to watering-places. Spring or well-water is conducted by means of pipes into troughs, out of which the sheep drink at pleasure; they in consequence drink oftener, and each time take less water, which is favourable to their health. The ordinary mode of watering sheep in that, and we may add in many parts of our own country, is attended with many inconveniences. The animals refuse to drink water in the winter, if it be too cold; they hurry while drinking, and do not take enough when the weather is very windy, or hail, rain or snow fall.

"Beside which, they often diminish their water with air feet; this disgusts them, and at length one part of the flock completely prevents the other from approaching the watering-place." And it has been advised to fold them before the dew falls in summer and winter, and not remove them till it exhales, letting them have hay or other dry food of some fort.

It is stated, that all grazing-land of rich quality ought to be flocked with sheep, cattle, and horses, so that the grafs may be eaten clean off; for, unless it is regularly depastured, much damage ensues. Each of the above three kinds of animals prefers, as most palatable food, some grafs which the others reject; and none of them will live near their own dung, though they may near that of others; and thus they conjointly contribute to keep the pasture level without much expence. Pastures or grazing-lands should be kept as level as a bowling-green, both for ornament and use; for, by one part being left higher than another, the long grafs keeps increasing in patches; and land where it grows may be considered as taken away from the pasture, as the cattle will almost sooner starve than eat it. By leaving the sort of grasses the animals refuse from year to year, the land increases in useless plants, and diminishes in useful ones; as the seed of such plants continually drops, and the useful ones are prevented feeding by the cattle eating them. If such pastures were mown in those places, it would give the useful plants room to grow. There are in this kingdom an infinite number of acres of rich and excellent breeding, from bad management, and from want of judgment in flocking, become of no more value than a barren field. But such grazing land as is intended for the purpose of feeding cattle, a few sheep are conceived absolutely necessary to eat up the weeds. If any part of the pasture be getting into bents, or higher grafs than it ought to be, and the animals begin to neglect it, you must mow it immediately, and as near the ground as possible; for the closer you cut down such coarse parts, the sweeter and the quicker will the grafs spring up in the place. Could animals, by charge, be

driven to eat the long grafs, they would not fatten upon it ; for, as the nearer the bone the sweeter the flefh, fo the nearer the ground the sweeter the grafs ; it is not, he fuppofes, fo much the quantity as the quality of the food that muft be attended to. And in further proof of the advantage of hard flocking, it is ftated, that it is a common complaint, that the land is good in fpring, but it goes off. Is this to be wondered at, when one-third, or perhaps one-half of the field is become fo rank, that no one animal in the pature will bite a mouthful of it ? Suffer the very beft piece of grafs-land, entirely free from weeds, to lie without either eating off the grafs, or mowing it, and in a few years it will be over-run with weeds, have very little ufeul grafs in it, and in fact be little better than rubbifh. Confequently, there can be little doubt of the beneficial confequences of hard or clofe flocking on the older forts of grazing-land ; but on the new leys it fhould probably be feldom attempted, as injury may be done to fuch lands without the flock being thereby adequately improved.

But in grazing farms, there are feveral different fyftems of management purfued, in refpect to cattle as well as fheep. The practice with fome graziers is, “ to purchafe their cattle in the fairs in the autumn-feafon, about October, or in the following month, fupporting them through the winter, principally with ftraw, or fometimes, which is a much better practice, with a little hay mixed with it, till towards the beginning of March, continuing their fattening through that and the fucceeding month with fome fort of fucculent food, fuch as turnips, potatoes, or other fimilar kinds, until the grafs be in a ftate fit to be turned upon in May, on which they may be carried forward and completed, according to circumftances, about Auguft, or in the following month.”

And another practice “ is to purchafe their beafts lean, as foon as the grafs-lands are in a ftate fit to be turned upon in May, wholly completing their fattening on the grafs about the latter end of October, or later in the autumn, according to their quicknefs in feeding. In this fyftem of management, the fmaller kinds of cattle flock may be found in general the moft advantageous, efpecially where the lands are of the lefs fertile and luxuriant defcriptions.”

Another practice, fometimes had recourfe to by grazing farmers, but which is, in general, perhaps lefs profitable than either of the above modes, is that of buying in flock at fuch periods, according to the difference in their fizes, as that they may be ready to be fold off about April, or in the fucceeding month, a period at which they ufually fetch high prices in the markets. It has been obferved, that “ in this fyftem, with large oxen or other forts of beafts, it is fometimes the practice to keep them through two winters, giving them only one fummer’s grafs ; being in the firft winter not fully fed, but kept in good grafs in the fummer-feafon, and forced on with the beft feeding in the fecond ; but with the fmaller forts of flock, one fummer’s grafs and a winter’s ftalling is the ufual mode ; the cattle being bought in as foon in the fpring as the grafs is rifen to a good bite.” It is in very few inftances that the animals can pay for this length of keeping. And, “ in fome diftricts, heifers are preferred to oxen ; in which cafe, they buy them in about March or April, and, after keeping them through the fummer, fell in October and November. This method is thought, by fome, a profitable fyftem of management.” By the author of the Modern Syftem of Practical Agriculture, on thefe different fyftems, it is noticed that they may all “ probably be practifed with advantage under different circumftances ; but it is obvious that the firft can only be had recourfe to with propriety, where green winter food is raifed in fufficient abundance, and the grazier has a ftore of litter

for being converted into manure. Under other circumftances, the fecond mode of management will be much more profitable. The two laft methods are the leaft convenient, and, probably, on the whole, except in very favourable circumftances, the leaft profitable, efpecially the former of them, as, from the great length of time which they are kept, much management and attention to food becomes neceffary to render them advantageous ; which, with common fervants, is feldom fufficiently regarded.”

But in addition to thefe feveral modes or plans of fattening neat-cattle, there is a practice followed in fome rich hay-diftricts near large towns, and particularly by the hay-farmers in Middlefex, which is, that “ of buying in fmall cattle in tolerable condition in the autumn, as foon as the after-grafs is ready, in order to their being fattened out on the rouens, and difpofed of towards the latter end of October, or beginning of the following month.”

And, regarding fheep flock, the fame difference of fyftem takes place ; as, in fome cafes, where the lands are in a ftate of inclofure, it is the “ practice to buy ewes in lamb in the latter end of fummer or beginning of autumn, keeping them on the inferior forts of grafs-lands, stubbles, or fallows, till the beginning of January ; and then, by giving them turnips or cabbages, to keep them in good condition through the period of their lambing, and afterwards in the beft manner that can be contrived, in order that the lambs may become fit for the butcher fufficiently early to admit of the ewes being afterwards fattened, and difpofed of in the beginning of the autumn.” This, in many cafes, is found a profitable fyftem of management, but which requires much care and attention in directing it.

Another practice in this bufinefs is, to purchafe wether flock about the beginning of May, at the age of two or three years, keeping them fparingly till fome weeks after the grounds have been cleared from hay ; then bringing them to good keep in the rouens, afterwards fattening them by means of turnips or cabbages, fo as not to have them ready fooner than the beginning of March, which is commonly the feafon in which they fetch the higheft prices. In this fyftem of grazing management, a good profit is moftly afforded by farmers who purfue it in a judicious and fteady manner.

And a further practice in fattening fheep is purfued in fome cafes with great profit and fuccefs, which is that of buying in lambs of the wether, or other kinds, about the beginning of September, which are kept in different methods by different graziers, being by fome brought forward with the greateft poffible expedition by the beft keep, fo as to be ready to be fold off as foon as poffible. But others have recourfe to the contrary method, keeping them only in a middling way during the winter, till about the beginning of April, and then forcing them forward by good keep, fo as to have them ready for the butcher in Auguft, or continuing them in the following month ; and then clearing the whole of the flock from the land. In this practice, large profits are often made by judicious graziers, efpecially when fituated near large towns where the population is great.

Another fyftem of fattening, which can only be purfued to advantage in fituations near large populous towns, is that of providing grafs-lambs for the markets as early as poffible in the fpring months, which pays the grazier well in many cafes. With this view, it is the practice to procure the more forward ewes, fuch as thofe of the Dorfet breed, which drop their lambs in the beginning of January, if not before. In Middlefex, where this management is much attended to, in confequence of the great demand, it is the cuftom

# GRAZING.

tom to purchase this sort of ewes at Kingston, Weyhill, and other fairs in the neighbourhood. The ewes, in order that they may have a plentiful supply of milk, are extremely well kept on turnips, brewers' grains, and fine green sweet rouden hay, and the lambs thereby forced forward in such a rapid manner, as to be ready for the markets in the beginning of March or April. And the ewes, from their becoming dry so early, are capable of being fattened and disposed of towards Michaelmas, usually fetching the prices at which they were purchased in at: as the whole of the flock is in this system cleared within the year, the farmer has the opportunity of fully ascertaining its advantage or disadvantage. The statement of which is thus given in the able Survey of the Agriculture of the County of Middlesex:

Statement.	£. s. d.
Lamb, sold at - - - - -	1 10 0
Ewe, do. do. - - - - -	1 10 0
Wool, 2s. 6d. or - - - - -	0 2 0
Together - - - - -	3 2 0
Deduct prime cost - - - - -	1 12 0
Remains the increase of an ewe in one year - - - - -	1 10 0

It is hinted, that "in this management very much depends upon keeping the ewes perfectly well fed, and in dry warm inclosed pastures, as without such attention the ewes are apt to become thin and lean, in consequence of the greatness of the evacuation, and afterward to require a much longer time in being made fat," by which much loss must be sustained. In the Economy of the Midland Counties, a practice in respect to fattening grafs-lambs, is suggested, which in particular cases may be beneficial; which is that of removing the lambs from the ewes when they decline much in milk, before they are perfectly fattened, in order to complete them on young clover, or other sorts of "prime keep." The chief object in this case is, that of the ewes becoming sooner ready for the butcher. Some, also, conceive, that after the first flush of milk is gone, and it begins to be scanty, the lambs thrive better "on grafs alone, away from the ewes," than when kept along with them, as the hankering after the little milk that is afforded prevents their feeding freely on the grafs. Hence it is supposed, that "where this method is followed, which can probably be with advantage only where the milk of the ewes is greatly deficient in supporting and bringing the lambs forward, much attention must be paid to having the keep early and in abundance. In this view, rye-grafs and white clover for early use, and broad clover at a later period, may be the most proper and useful crops. In this management the ewes should be carefully examined occasionally; and, where much deficiency in the milk is found, the lambs be immediately removed to the pastures."

In respect to the stocking of grafs-lands in the most advantageous manner for the grazier, it must depend materially on the richness of the lands, and the nature of the flock in respect to size, and other circumstances. But, according to Mr. Billingsley, the Somersetshire graziers, in stocking the rich and middling sorts of grafs-land, allow, to an ox, from one acre to an acre and a half; and some add one sheep to each ox. But, in Lincolnshire, they stock in much larger proportions; as is shewn in the Agricultural Survey of that district, where they are brought into a tabular form as below, for the more rich pasture land.

Table of Stocking rich Pastures.

Name of place	Sheep in summer per acre.	Acres per bullock in summer with the sheep.	Sheep in winter per acre.	Rent
Long Sutton - - - - -	5 $\frac{1}{2}$	2 $\frac{1}{2}$	2	
Mr. Scroop - - - - -	11	No bullocks	2	
Boston, &c. - - - - -	4	1 $\frac{1}{2}$	2	
Skirbeck - - - - -	5	1 $\frac{1}{2}$	2	
Boston - - - - -	5	1	3	
Deeping Fen, Mr. Graves	5	2	1 $\frac{1}{2}$	40
Aldersburgh, Mr. Berridge	7	2	3	
Swinehead - - - - -	2 $\frac{1}{2}$	1	2	
Ewerby - - - - -	3	2 $\frac{1}{2}$	2	30
Horbling, &c. - - - - -	3	2	2	
Hovel - - - - -	3	3	2	
Immingham - - - - -	1	1 $\frac{1}{2}$	2	
Granchorpe, &c. - - - - -	3	3	1 $\frac{1}{2}$	
Stallenborough - - - - -	2	2	2	
Skidbrook - - - - -	1	1 $\frac{1}{2}$	1	
Ditto, &c. - - - - -	2	2	—	35
Addethorpe - - - - -	5	1 $\frac{1}{2}$	2	40
Gosberton - - - - -	6	1	2	
Burgh, &c. - - - - -	5	2	2	40
Wrangle - - - - -	2	2	—	36
Hundred of Skirbeck - - - - -	2	1 $\frac{1}{2}$	2	45
Wibberton - - - - -	5	2	2 $\frac{1}{2}$	
Marth Chapel - - - - -	3	2	—	35
Ditto - - - - -	3	1	—	45
Grimby - - - - -	2 $\frac{1}{2}$	1	2 $\frac{1}{2}$	
Average - - - - -	3 $\frac{1}{2}$	1 $\frac{1}{2}$	2	

Upon this it is observed, that "considering the size of the sheep, which cannot be estimated at less than 24lb. a quarter, on an average; and that the bullocks rise from 50 to 100 stone (14lb.), this rate of flocking is very great indeed. There are, on every acre, 300lb. of mutton, and reckoning the bullocks at 42 stone, each eight, there is also 336lb. of beef; in all, 636lb. of meat per acre in summer, besides the winter produce, which is immense."

But, in the rich grazing counties in the more southern parts of the island, a large proportion of both sheep and cattle stock is admitted per acre: the exact proportion, however, differs with different graziers very greatly.

But the great and leading principle in this business is, however, never to stock in such a manner as to restrict the animals in the least; as it is by their being enabled to fill themselves quickly, and to lie down much, that the greatest progress and advancement in fattening are made, whether in stock of the cattle, sheep, or any other sort, when at grafs. But, on the inferior or weaker grafs-lands, a much smaller proportion of stock than on those of the rich and fertile kind only can be employed. It can frequently not be more than an ox and a sheep or two, to two acres, or two acres and a half. However, in stocking with neat-cattle, for the purpose of fattening, it should constantly be such as that the animals may have a full bite; but with sheep, such as to keep the pasture in a rather close state of feeding. Another circumstance is necessary to be attended to, in order to bring the grazing-stock properly forward in pastures, which is that of changing them more frequently than has generally been the case with grazing farmers. And it is, perhaps, on this principle, as well as those of their affording greater

degrees of warmth and shelter, and thereby promoting the growth of the herbage more abundantly; that small inclosures are more advantageous in this practice than those of a size larger. See PASTURE.

But the practice of different districts, where the grazing system is much in use, will, however, afford a more clear idea of this sort of management. In the Agricultural Survey of Lincolnshire, it is stated, that in the low-land in Barton on the Humber, there was a horse-pasture and a sheep one contiguous, and upon the inclosure it was remarkable to observe the great difference between them; that which had been under sheep so greatly superior. And in the tract of marsh-land on the sea-coast they observe, that, where most grafs is left in autumn, there the herbage is the coarsest and worst next year. The remark was, it is observed, made in answer to recommending eddish for spring-feeding sheep, which they thought would not do on rich marsh, though it might on uplands. This likewise shews that the Romney Marsh system of close feeding is right, and would answer as well in Lincolnshire. And in the hundred of Skirbeck, they like, it is added, to have a tolerable head of grafs in the spring, before turning in; and afterwards to stock as to prevent its getting coarse by *running away*, so as to prevent the necessity of *hobbing*, which, however, must be done in a wet growing season. Mr. Parkinson observes, that the best sheep are changed the better. This remark, which he takes to be very just, demands, he says, attention: it bears on the question of folding. Beasts are changed while *hobbing* is done; and the sooner it is hobbled the better, as, if cut while young, cattle will eat it. But in Somersetshire, according to Mr. Billingsley, in summer feeding, attentive farmers have the dung which falls from the animal scraped up and wheeled into heaps, and the thistles and rough spots frequently mown. Besides they make a point of excluding horses and sheep from their cow-pastures. And when their mown ground is fit to be stocked, they hay their summer lease, so as to have a good supply of rough grafs or rouch in the winter. They also mow and feed alternately, by which means the best sorts of grafses are preserved and encouraged; and in the Synopsis of Husbandry, it is stated, that, "when the summer turns out moist and growing, the herbage often shoots faster than the stock can eat it down. In this case it is common in Kent, to brush over the marshes at the mowing season, though they had not been originally laid in for that purpose; by which economy the farmer becomes possessed of a much larger portion of hay than he had before formed an expectation of, and which, in countries where this commodity fetches a good price, is an advantage whereof he is right to avail himself; for these casual brushings may probably furnish him with a quantity of winter provender sufficient to his own use; whilst those marshes which were primarily intended to be mown, and having been designedly laid in with that view, will produce a commodity of a better quality and more saleable; that may be disposed of at market. On the removal of this old grafs, the ground is left at liberty to send forth a more vigorous shoot in the autumn, so that these rouens do at that time produce a sweet and wholesome pasturage, which would otherwise have been choked up with the rotten core of the last year; yet there are cases where it may be necessary to suffer this old grafs to remain on the ground, as where a portion of food is required for the cows or other horned beasts in the winter. Then this old core, having been sweetened by the frosts, will be found exceedingly useful, and the cattle will at that time greedily devour what in the summer months they turned from with disgust."

The same writer also adds, that "the manner of stocking a grazing farm in the marshes differs according to the nature of the land. In Romney Marsh, the views of the grazier are chiefly directed to the breeding and management of sheep: and in the Isle of Sheepee, both bullocks and sheep claim his attention, whilst in some parts the marsh land is wholly appropriated to the breeding of horned cattle and colts. Those grazing farms are most eligible, which admit of breeding and fattening on the same pasture. This is the case with Romney Marsh, a tract of land so eminently distinguished for a valuable breed of polled sheep, that it furnishes the graziers of Sheepee, and other places in this county, with an annual supply of lean-stock over and above what is reserved for feeding; so that it is evident the grazier here enjoys a double profit from his farm, though it is believed, since the increased value of lean-sheep, that the graziers in the Isle of Sheepee have many of them adopted the method of breeding their own stock." This is probably the most beneficial practice.

In the county of Westmoreland, the cattle bought in in September are wintered on the coarse pastures and in the straw-yard. In May following the young ones are sent to the commons; and those of an older description turned upon the best pastures as soon as possible, according to the earliness of the situation. But in the Agricultural Report of the North Riding of Yorkshire, it is said that "there the usual time of breaking the pastures is the 12th May, from which time they continue regularly stocked until about October, when, if the stock consists of milch cows, or feeding cattle and sheep, they are removed to fog (after-grafts); the pastures, with the addition of the stubbles, remain stocked during the winter with store sheep or lean cattle; but the latter are, by many farmers, taken into the straw-yard for the night. The herbage of the pastures is, however, it is thought, thus completely destroyed before winter, and the land thus left naked is starved, and the growth of moss greatly encouraged, to the almost certain ruin of the grafs-land. An instance has not occurred in the course of the survey, of the practice of preserving a considerable part of the summer growth of grafs upon the land, for spring feed, a practice well worthy of attention. This winter clothing, it is supposed, enriches the swards, destroys the moss, and, by keeping the roots of the grafs warm, causes an early vegetation in spring, when the scarcity of the herbage so much enhances the value of it. On farms, the soil of which is not adapted to turnips, this practice would, it is said, be peculiarly beneficial."

"In March, the land intended to be pastured the ensuing summer, is, or ought to be freed, and the stock put into the land intended to be mown, where they remain, until those pastures are broken up in the beginning of May.

"In the dales of the Moorlands, the lower lands only are adapted to meadow; consequently, the land cannot be changed alternately from meadow to pasture, as may be practised in many other parts of the Riding; though there, as before noticed, the practice is not sufficiently attended to. There are many instances of cow-pasture, which have been invariably summer-fed during several generations." See PASTURE-LANDS.

"The best farmers usually pasture their new laid ground the first two years, and that chiefly with sheep, as sheep improve grafs more than any other kind of stock, both by their treading more lightly and uniformly, and by the dung and urine being more regularly dispersed over the land. But the practice of eating them very bare during the first autumn and winter after sowing, and also mowing them the first summer, is too prevalent; such practices are, it is observed,

served, the ruin of feeds. Some, however, think that pasturing new laid ground is most excellent management; the several grasses, by being frequently cropped, become not only firmer in nature, but much more numerous. Stock, when pasturing new lands, ought to be often changed; if ever you over-eat, they will require some time to recover their usual vigour. New laid-grounds sometimes give sheep the rot, particularly three or four years laid, on indifferent soil."

And the practice of shifting the flock from one pasture to another, of mixing different kinds of flock together in a due proportion in the same pasture, and under stocking with sheep, pastures destined for feeding larger cattle, should always be particularly attended to.

It is stated in the Survey of Lincolnshire, that "the rich grazing lands are the glory of that county, and demand a singular attention. The soil is a rich loamy clay, some very stiff, but of uncommon fertility, as may be seen by various instances. Some of the grazing lands in Long Sutton that were common, will carry five or six sheep an acre, and four bullocks to ten acres. Mr. Scrope has there four acres, which carry 35 sheep in summer, and must be *holled* often to keep it down. And on the grass-lands in Deeping Fen, improved by paring and burning, Mr. Graves keeps five sheep an acre from Lady-day to Michaelmas, and one and a half in winter, and a bullock of 60 stone to two acres besides in summer."

And from some trials which were made by T. Fyde, esq. in the grazing of neat cattle on the best sort of ground in Lincolnshire, and which are given below, Mr. Young is led to conclude, that 3/ an acre is the highest rent he has heard of in that county, and much higher than common, even for the best lands. This seems to confirm the idea he has entertained, that the rich grazing lands of this district are lower rented than such or nearly such lands in other parts of the kingdom. And further, that "the average weight of the bealls was 70 stone, being of the York or Lincoln breed; the sheep all Lincolns. The former bought in April or May, and all gone by the 11th of December; the sheep are bought in May; they are clipped twice, and sold fat in April or in May following; that there is little difference in seasons, except that, after a bad winter, the sheep are not ready for market so soon by a month as they are after good winters. The loss in weight in driving to Smithfield is very little; the expence, bealls 15s. 9d. sheep 1s. 9<sup>1</sup>/<sub>2</sub>d. each. Mr. Fyde held for several years a piece of land in Skirbeck parish, which measured 21 acres, and kept, *communibus annis*, from Lady-day to Michaelmas, 19 heavy bealls, and a 100 sheep, and wintered fifty sheep. And he now holds a pasture adjoining his garden, at Boston, of eight acres, which keeps in summer ten oxen and forty sheep, and winters thirty sheep. But the finest grazing lands are at Boston, Alderchurch, Fofdyke, Sutherland, Kirton, Frampton, Wibberton, and Skirbeck: these will carry, in summer, a bullock to an acre and a half, besides four sheep an acre; and two sheep an acre in the winter season."

It is stated that "the Rev. Mr. Berridge, of Alderchurch, has near his house forty acres of the rich grass, upon which the flock is upon an average 300 sheep, sixteen fattening bullocks, three cows, four horses, and carries through the winter three sheep an acre. This land is valued at 20s. an acre. It is a vall flock. He favoured him with these particulars in the presence of a dozen neighbours, and called in his manager to confirm it; it wanted, therefore, no after-corrections." And "in the grazing lands at Swinhead, a

beast an acre of 40 to 70 stone, and two or three sheep; also two sheep an acre in winter. Mr. Tindal, at Ewerby, which is on high-land, compared with Holt and Fen, stocks a bullock to two and a half acres, and three more per acre in summer, and two sheep an acre in winter. And by the lordships of Horbling, Plimgborough, Barthorpe, Southpringham, Pointon, Dowby, Dunby, and Mackonby, there are extensive tracts of rich grazing land applied to fattening bullock and sheep, carrying a bullock to two acres, and three sheep per acre in summer; and two sheep an acre in winter, which lands are generally rented at 30s. per acre. Mr. Elkington, of Howel, keeps one bullock and nine sheep to three acres, and in the winter two sheep an acre." But "Hanworth, north of Lincoln, is chiefly grass which is fed by cows, calves, and young cattle. On the Lawn at Norton Place, which is heath-land, two couples per acre in summer; but the soil not adapted to permanent grass without great exertion." And "there is a tract of pasture-land, which is of considerable extent north and south, but very narrow east and west, which lies in the vale between the heath and the Wolds. He viewed it from Norton Place in going to Owerby, which is in it; the quality is good, but of the second rate." And further, that "the grass-land close to Grainsborough lets at 4/ and 5/ an acre. The marsh grass on the Trent and Knaith, &c. 20s. to 30s. and produces one and a half or two tons of hay an acre. The marshes on the river are flocked from the 12th of April to the 12th of May; this of late has, however, been omitted, as they found the grass hurt by it. Clear the lay by Larmans, one to one and a half ton an acre. Then turn in middle-20s. and afterwards other stock, till November. Rent 20s. but measure short. And at Garthorpe, in marsh-lands, fine rich grazing lands, which will carry a good bullock an acre, but no sheep fed. This land is now let to break up at 3/ 15s. an acre for 14 years." But that "Mr. Hickley, at Barton, has four acres near the town; levelled and manured it after the allotment, and this year it feeds nine cows: three of them joisted at 3s. a week, a produce of 12 guineas. At Immingham and Stallenborough, there are some marsh-lands that will carry nine bullocks of 80 stone upon 12 acres, and 12 sheep, and two sheep per acre in winter; some has only one. But the same lordships have, it is remarked, clay pastures that will not do any thing like this. And, at Thornton college, Mr. Uppley has a few closes of extraordinary fine grazing-land, which will carry the largest bullocks, and it is worth, he thinks, 50s. an acre rent.

"The marsh on the coast of Grainsborough, Saltfleetby, and Theddlethorpe, &c. is very good: it will keep three sheep an acre, and an ox to three acres; and one sheep and an half to an acre in winter. The hilly wold good pastures on marl and chalk at Gayton, near Louth, will carry three ewes and three lambs *per* acre, and a sprinkling of young cattle, &c. besides; some only two ewes and lambs, besides cattle, such land as is worth 15s. to 20s. an acre. In the marshes that are in the vicinity of Saltfleet and Sutton, there is some distinction, which it will be proper to note by parishes. In Northcote, the quality rather inferior, being chiefly for breeding. Mars Chapel, better, but still weak; and for breeding also. In Grainsborough, a great deal very good grazing land. Conilhelm, low, swampy, and but little good. Skidbrook, a great deal, and very good. South Somercotes, the same; but 1000 acres of 1/2s. or common meadow. The three Saltfleetby's 5000 acres, and a great deal very strong and good for feeding beasts. Some of the late Mr. Chaplin's marshes have sold so high as 7-/- the

# GRAZING.

statute acre. In general, the measure short from Saltfleet to Sutton, there statute. In the Theddlethorpes, much very good; but some low, and not well drained. Marblethorpe, very good. Sutton, remarkable good and strong feeding land.

“In these marsh parishes, the rich grazing ground of the first quality lets at about 40s. an acre, and the rest about 30s. Such as will not feed, but only breed, at 20s. to 25s.; and this distinction of feeding and breeding is here also expressed by saying, that one sort of marsh will feed sheep; but the other, keep them in holding order, will make them hold the flesh they have got, but not fatten profitably. If the best of these lands are compared with the grazing districts of Boston and its vicinity, it was remarked to him, that these are more naturally good, and much better watered: they have at all times plenty of fresh water here, which is a great object; but for artificial fertility, locality to fairs and markets, &c. the Boston lands are much superior. The measure at Boston, &c. is here said to be more than an acre; here less, not more than three roods, and the *ing* land still less. On ten acres, at Skidbrook, eight beasts and sixteen sheep have been summered, and the sheep wintered also. And, in general, the marsh that lets from 30s. to 40s. will carry a beast to two acres, and two sheep an acre; but, perhaps, he says, more generally one and a half sheep.”

With respect to the profit of grazing the best land, it is stated in this manner:

### Statement.

A beast bought at 20 <i>l.</i> to two acres, at the profits of 5 <i>l.</i>	£. s. d.
Two sheep <i>per</i> acre, bought in at 45 <i>s.</i> and sold at 55 <i>s.</i>	- 2 10 0
Four fleeces at 9 <i>l.</i> 38 <i>lb.</i> at 8 <i>d.</i>	- 1 0 0
	- 1 5 4
	4 15 4

### Expences.

Rent	£. s. d.
Tithe	- 2 0 0
Rates	- 0 1 0
Dyke-reeve	- 0 3 6
	- 0 0 9
	2 5 3
Shepherding	- 0 1 0
Washing and clipping	- 0 0 6
Incidents	- 0 0 6

### Capital employed.

Beasts	£. 20 0 0	£. s. d.
Sheep	4 10 6	1 6 6
	24 10 6	
A year's rent	2 0 0	
	26 10 6	
		3 13 9
At 5 <i>l.</i> <i>per cent.</i>		Profit - 1 1 7

Here the total interest made is about 9*l.* *per cent.* on the capital of 26*l.*, and this seems to be rather inadequate, for there is nothing for losses, which, in a course of time, must be something considerable. The interest made ought to be, at least, 10*l.* *per cent.* after a proper deduction for losses.

Either, therefore, the land carries more stock, or it is too highly rented. Grazing is accounted a profitable profession; but when it is considered that this 26*l.* capital would stock five acres of good arable land, and that they could not be reckoned to pay a less profit than from 12*s.* to 15*s.* an acre, from 3*l.* to 4*l.* 5*s.* it will appear that the plough is much more beneficial than such grazing calculated in this way.

Mr. Kershaw, of Driby, and Mr. Bourne, of Haugh, agree in the following marsh account for land there at 25*s.* the acre.

### Produce.

Two sheep at 10 <i>s.</i> the summer	£. s. d.
Two ditto in winter	- 1 0 0
Half the profit on an ox	- 1 0 0
	- 1 13 4
	3 13 4

### Expences.

Rent	£. s. d.
Tithe	- 1 15 0
Rates and dyke-reeve	- 0 3 0
Shepherding	- 0 8 0
Cutting thistles and dressing	- 0 1 0
Ditches, folds, &c.	- 0 2 0
	- 0 0 6

### Interest of Capital.

Bullock, half £.6 0 0	£. s. d.
Two sheep	3 0 0
Rent	2 0 0
	0 11 0
	11 0 0

Going to look at stock £.0 0 6

Produce	£. 3 13 4
Expences	- 3 1 0
	Profit 0 12 4

The gross interest rather better than 10*l.* *per cent.*

Mr. Parkinson, of Reevesby, observed, that the rich marshes were better managed, and in better order, twenty years ago, than they are at present; the wold farmers had not then got such possession of them, and they were in the hands of resident graziers, who attend much more to *holbing*, which kept them fine; for nothing hurts marsh land so much as letting it run coarse, from permitting the grafs to get a head. And he calculates an acre of rich marsh in Wrangle, &c. thus,

### Expences.

Rent	£. 1 16 0
Tithe	- 0 0 0
Rates	- 0 6 0
Shepherding	- 0 1 0
	2 3 0
Dyke-reeve	- 0 0 8
Ditches, folds, and gates	- 0 0 6

*Interest*



# G R A Z I N G.

## Interest of Capital.

2 Shearlings	£.5	0	0	
Bullock to two acres 20l.	10	0	0	£.0 17 0
Year's rent	2	0	0	
	17	0	0	
	<hr/>			
	3	1	2	

## Produce.

Improvement of 2 sheep, 4 fleeces, 3 to a tod, 1 <sup>1</sup> tod	-	-	-	1	6	8
Difference in price 10s.	-	-	-	1	0	0
	<hr/>			2	6	8
Losses 5l. per cent.	-	-	-	0	2	4
	<hr/>			2	4	4
Bullock, profit about 4l.	£.2	0	0			
Losses one-fortieth	0	1	0			
	<hr/>			1	19	0
	<hr/>			4	3	4
Expences	-	-	-	3	1	2
	<hr/>			1	2	2
Profit per acre	-	-	-	1	2	2

Or total interest 11l. 5s. 6d. per cent.

In the hundred of Skirbeck, the pasture consists of three ferts in point of rent. &c. the highest at about 45s. being from 32s. to 50s. The second from 26s. to 32s. average 28s. The third, average 1l. 1s. Besides this a small quantity of open meadow, called *ings*, average about 18s. The best kind of pasture is chiefly stocked with shearling wethers, bought at the spring market at Boston, which, having yielded two fleeces of wool, are sold off easily in the next year; and by beasts in the summer, sold in autumn; some kept on farther in eddish, but all gone in the winter. The second best is chiefly fed by young beasts and hogs, kept on to shearlings: these are well kept, as their value materially depends on it; there are also some few breeding sheep on this division of the pasture. The third class is chiefly mown. But it is to be noted that all these particulars relate to an acre larger than statute measure, about  $\frac{3}{4}$  roods."

"The first division is stocked at the rate of three sheep per acre, winter and summer, with the overplus of some bought in the spring, and not cleared from the land till some months later than the time at which they are bought. The beasts are in proportion, on an average of seven to ten acres, from 54 to 100 stone. The second class winters about five sheep to two acres, with not less than four per acre in summer, with a few cows and young beasts; and on both these there will be some few horses, too uncertain to average. On the best land, they are chiefly horses making up for sale; and, on the second quality, horses employed in work, or young ones; it is not usual to keep any horses in summer except on the pastures. The produce of hay on the third may be about 35s. an acre; the eddish eaten by cattle from the other grounds; or by lambs or hogs, before they go to their winter keeping.

## Grazing Account of ten Acres of the first Quality.

	Expences.	£.	s.	d.	
" Rent	-	-	22	10	0
Tithe, 3s.	-	-	1	10	0
Town charges.	£.	s.	d.		
Poor and comtable, &c.	-	0	2	7	
Church	-	0	0	3	
Highways	-	0	0	5	
	<hr/>				
In the pound	0	3	3		
	<hr/>				
			3	12	9
Dyke-reeve, 5d.	-	-	0	4	2
Shepherding, 2s. 6d. an acre	-	-	1	5	0
Fences, 1s.	-	-	0	10	0
	<hr/>				
			29	11	11
Interest of capital					
Seven oxen, at 14l.	-	98	0	0	
Thirty sheep, 45s.	-	67	10	0	
Enters at Lady-lay, but a year's charges	-	27	0	0	
Surplus necessary, because of sheep unfold at time of purchase	-	18	0	0	
	<hr/>				
			210	10	0
Interest at 5l.	-	-	10	10	0
Losses on flock very little indeed, 1l. per cent. will probably cover it	-	-	2	2	0
Cutting thistles, hobbing equal to it, stock as above	-	-	165	10	0
	<hr/>				
			207	13	11
Incidents	-	-	5	0	0
	<hr/>				
			212	13	11
Profit	-	-	15	16	1
	<hr/>				
			228	10	0

## Produce.

Seven beasts, at 2l. 10s.	-	-	121	10	0
Thirty sheep, at 54s.	-	-	81	0	0
Sixty fleeces, at 8s.	-	-	24	0	0
A horse, twelve weeks	-	-	2	0	0
	<hr/>				
			228	10	0

Per acre 1l. 11s. 6d. profit.  
Produce 6l. 6s. 0d. per acre."

The writer hints that the profit upon this first class of land is greater than upon the rest; and that the third fert yields very little profit by grazing, and would pay much better in tillage. There are many graziers there, who have no other land than what is upon these flats, and some who are supposed to have made by their business enough to have realized

## G R A Z I N G.

realized a comfortable subsistence. The grazing accounts of certain fields in the occupation of Mr. Loft, of Mash Chapel, are stated in this way :

<i>Expences.</i>			
“ Rent	-	-	£1 15 0
Tithe	-	-	0 2 0
Rates	-	-	0 3 0
Shepherding	-	-	0 1 0
Interest of capital	-	-	0 12 0
			2 13 0

“ It carries a bullock to two acres, and three sheep per acre.

<i>Produce.</i>			
“ Half a bullock	-	-	£1 10 0
A sheep and half	-	-	1 10 0
			3 0 0
Expences			2 13 0
			Profit 0 7 0

Of better land.

Rent	-	-	£2 5 0
Sundries	-	-	0 7 0
Interest of capital	-	-	1 4 0
			3 16 0

It carries a bullock and three sheep an acre.

A bullock	-	-	3 0 0
Three sheep	-	-	3 0 0
			6 0 0
Expences			3 16 0
			Profit 2 4 0

It is however stated, that very few fields will yield any thing like this: he has but one clove; and there are some expences omitted. And “ Mr. Tennison, of Lincoln, has 13 acres of marsh at Grimby, that summer-feeds 14 bullocks; and carries 35 sheep the year through.” But that “ in the tract of marsh-land on the sea-coast, they observe, that where most grafs is left in autumn, there the herbage is the coarsest and worst next year; the remark was made in answer to recommending eddith for spring-feeding sheep, which would not do on rich marsh, though it might on uplands.” It also shews, that the system of clove feeding is proper, and would answer well in many districts where it is not the practice.” And “ in the hundred of Skirbeck, they like to have a tolerable head of grafs in the spring, before turning in; and afterwards so to flock as to prevent its getting coarse by running away, so as to prevent the necessity of hobbing, which, however, must be done in a wet growing season.”

But after the flock has been brought into a proper state for the market, there is in many situations much difficulty in disposing of it to the best advantage. Mr. Marshall has

remarked, that though it be attended with less difficulty than that of buying in the flock, it requires much knowledge, as well as experience, to execute it in the best manner, or with the least possible loss. A due consideration of the progress of the flock while feeding, and of the length of time they have been upon the land, may afford some sort of guide in the business; but the most correct judgment may be formed by the young grazier, by the practice of frequent weighing, and the accurate comparison of the living with the dead weight of such flock as are killed in his neighbourhood, as it is a much more certain method than the use of the eye and hand, as has been shewn under the head GRAZIER. Having recourse to frequent weighing has also the advantage of shewing the progress that is made by animals under different sorts of keep or food. But besides this, the grazing farmer must be regulated in the sale of his flock by the nature of his situation. In most of the mid-land and southern parts of the kingdom, Smithfield is the place where the fat flock of the farmers are disposed of: while in other parts, they are frequently sold in the neighbourhood, or to the large towns which are at no great distance. In the former cases, especially on the less extensive farms, the fat flock are brought up by persons, who make it a business, being employed by various graziers in the same vicinity, who have an entire confidence in them. With the more extensive graziers, who send up frequent lots, the business is done by a salesman, in whom they have confidence. With little grazing farms, the custom is often to sell them to the butchers in the neighbourhood, which is frequently the best method. And the advantages of these different modes must depend greatly upon circumstances. Some, however, suppose that the London market is the best calculated only for those who give a weekly attendance, on account of the uncertainty of the supplies. The expences being materially different, as with the salesman's commission, they frequently amount to twelve shillings a head there, while in the country they are not more than from three to five. Consequently, that fat flock may in many cases, where only a few, or what are termed small lots, are to be disposed of, be sold at home with less expence than having them sent to distant markets; but that with large lots, the latter mode must be had recourse to, as more certain, expeditious, and convenient. Upon the whole, the facts which have been stated fully shew that the advantages of the grazing system must be materially different under different circumstances, and be greatly influenced by those of a local kind. It has indeed been remarked by a Kentish grazier, that the profits of no two grazing farmers are exactly “ alike on the same given quantity of land,” nor even on the same land, as years, prices, as well as the exertions and talents of each individual, are different. In all cases, the superiority of the success must in a great measure depend upon the knowledge, exertion, and excellence of the method which is adopted by the particular farmer. Statements can of course only shew what are the general profits of the system. With neat-cattle, in the western and mid-land districts, they are given by Mr. Billingsley, and Mr. Young, in the Surveys under the direction of the Board of Agriculture. In this way, the former says, that a grazing farmer who has 200 acres of land, may fatten annually one hundred head of cattle, as oxen, with seventy sheep and ten colts, which together may afford a comfortable but not exorbitant profit to him.

# G R A Z I N G.

*Statement.*

<i>Dr.</i>	<i>£.</i>	<i>s.</i>	<i>d.</i>
To rent of 200 acres, average value 40s. an acre	400	0	0
To tithe and taxes, say	50	0	0
Feb. To fifty oxen, at 11 <i>l.</i>	550	0	0
July. To fifty oxen, at 7 <i>l.</i>	350	0	0
To mowing and making fifty acres of hay, at 10s.	25	0	0
To skinning and making fifty acres of summer-leaze, at 3s.	7	10	0
To wages throughout the year, besides the farmer's labour	50	0	0
To accidents	20	0	0
	1452	10	0
To profit (interest of capital and accidents included)	277	10	0
	1730	0	0

*Cr.*

	<i>£.</i>	<i>s.</i>	<i>d.</i>
Oct. By fifty oxen, at 18 <i>l.</i>	900	0	0
May. By fifty oxen, at 13 <i>l.</i>	650	0	0
By profit on seventy sheep, summer kept	40	0	0
By profit on ten colts	40	0	0
By profit on two hundred sheep winter fattened, and sold in April unshorn	100	0	0
	1730	0	0

And on the rich grazing lands in Lincolnshire, according to the latter writer, the practice seems to afford a much greater advantage to the farmer; as the account, given by T. Fydeil, esq. M. P. for twenty acres, in 1796, stands thus:

*Statement.*

<i>Dr.</i>	<i>£.</i>	<i>s.</i>	<i>d.</i>
To 18 beasts, at 12 <i>l.</i> each	216	0	0
To 80 sheep, at 4 <i>6s.</i>	184	0	0
	400	0	0
<i>Expences, viz.</i>			
Tithe	1	10	0
Dyke-reeve	3	0	0
Rates	10	0	0
Shepherding	3	0	0
Expences	5	0	0
	22	10	0
Loss, supposed one sheep	2	6	0
	424	16	0
Interest one year	21	4	0
One year's rent	60	0	0
	506	0	0
Hire of a clove for the winter, for 35 sheep	17	10	0
	523	10	0
Profit	87	4	0
	610	14	0

*Cr.*

	<i>£.</i>	<i>s.</i>	<i>d.</i>
By 18 beasts, at 19 <i>l.</i> 5 <i>s.</i>	345	10	0
By 80 sheep, at 55 <i>s.</i>	220	0	0
By 52 tod of wool, at 17 <i>s.</i>	44	4	0
	610	14	0

And that "the difference between the buying and selling price, loss deducted, 20*l.* 8*s.*, is the produce of the land, or 10*l.* 8*s.* per acre, which is very great indeed, and shows that this land would let at 5*l.* 4*s.* per acre, being thus year to year an average gain.

"This difference of rent would deduct 4*l.* from the profit of 87*l.* and leave 43*l.* which, with 2*l.* charged, makes 6*l.*; interest on the year's advance of 546*l.*, or 11*1*/<sub>2</sub> per cent."

But in the system of grazing pursued in some of the southern rich marshy districts with sheep, as stated some time ago, the amount stands, as below, according to Mr. Price; but at present the profit must be much larger, from the improved management of the Romney Marsh graziers in general.

*Account of Stock bought in for Fifty Acres of Pasture Land, for the Year 1778.*

	<i>£.</i>	<i>s.</i>	<i>d.</i>
310 barren ewes, at 1 <i>l.</i> 10 <i>s.</i> each	325	10	0
90 South Down wethers, at do.	94	10	0
10 fleer runts	9	15	0
10 Suffex oxen	115	0	0
8 Steer runts	40	10	0
Rent, at 30 <i>s.</i> per acre	75	0	0
Expences, at 5 <i>s.</i> per acre	12	10	0
	770	15	0

*Stock sold off Fifty Acres of Pasture Land, in the Year 1788-89.*

	<i>£.</i>	<i>s.</i>	<i>d.</i>
310 barren ewes, at 3 <i>1</i> / <sub>2</sub> <i>l.</i> each	480	10	0
90 South Down wethers, at do.	130	10	0
10 fleer runts, at 13 <i>l.</i> each	130	0	0
10 Suffex oxen, at 15 <i>l.</i> each	150	0	0
10 ditto, to keep 18 weeks, at 2 <i>s.</i> per week each	18	0	0
8 fleer runts, sold at 9 <i>l.</i> each	72	0	0
2 ditto, to keep 12 weeks, at 1 <i>l.</i> 6 <i>d.</i> per week each	1	16	0
8 packs 3 draughts of long wool at 8 <i>l.</i> 10 <i>s.</i>	74	7	6
1 <i>1</i> / <sub>2</sub> ditto of fine wool, at 12 <i>l.</i>	18	0	0
	184	3	6
Total	184	3	6
Deduct	770	15	0
	584	18	6
Clear profit	313	8	6

*Profits on Fattening Land, allowing 10*s.* for each Sheep.*

	<i>£.</i>	<i>s.</i>	<i>d.</i>
Winter, 2 barren ewes, off in May	1	0	0
Summer, 5 wethers, off at Michaelmas	2	10	0
Wool of 7 sheep, at 12 <i>l.</i> per pack	2	2	0
One bullock to fat	3	0	0
	8	12	0

Rent

# GRAZING.

	£.	s.	d.	
Brought over	-	-	-	perhaps about 30s.; and some old leases 1 <i>l.</i> breeding land."
Rent	1	10	0	It is stated that where sheep, in order to fatten them in a more expeditious manner, or to finish them in cases where the grafs is insufficient for the purpose, have the addition of turnips or other sorts of luxuriant green food, great care should be taken, by the grazier, that a due proportion of some sort of dry material be had recourse to at the same time; as without such precaution, not only loss may be sustained by the death of some of the sheep in particular instances, but by their making less progress in becoming fat than would otherwise be the case. Hay, cut chaff, bran, or a few oats, answer the purpose very well. See SOIL-ING.
Expences	0	5	0	
Affixes and taxes	0	5	0	
	2	0	0	
Clear profit	6	12	0	
One acre.				
Three wethers, on at Michaelmas	1	10	0	
Two ditto, in May	1	0	0	
Wool	1	10	0	
One bullock to fat	3	0	0	
	7	0	0	
Rent, &c. as before	2	0	0	
Clear profit	5	0	0	

### Profits on Breeding Land.

	£.	s.	d.
One acre.			
Winter, 2 <sup>1</sup> ewes and 3 lambs, at 1 <i>l.</i>	2	2	0
Wool of 2 <sup>1</sup> ewes	0	13	0
Wool of 3 lambs	0	4	6
Wool of one teg	0	4	0
The summer improvement of do.	0	5	0
Joint bullock keep	0	10	0
	3	18	6
Rent	1	0	0
Expences	0	5	0
One in twenty loss by deaths	0	7	0
	1	12	0
Clear profit	2	6	6

It is remarked, "on the first of these statements, that the year was favourable for vegetation; and that such profits could not probably be made seven years together, which is the most accurate method of calculating profits on land. There being no affixes on the land, also, makes it more profitable." And further, that two modes in respect "to the profits on fattening land are stated; the first used by the best graziers; the other, the most common: some take bullocks in to keep, others buy runts; the profits of which must depend on their judgment; but 3*l.* is the medium profit between the whole: 10*s.* each sheep is generally allowed as the gained profit by fattening." It is added that "it cannot be supposed that this profit will always amount to so much as the years differ; therefore dry seasons will abate it, and a large tract of land cannot have the supply of stock to make it so great. There are losses to be taken out; but, upon the whole, it is very profitable, as the expences are so moderate, that one servant-man can manage a thousand acres of pasture-land. The value or rent of land is put too low, except for long leases unexpired, or where a large quantity of land is taken. The average price of rent is from 40*s.* to 3*l.* for fattening land, unless four or five hundred acres of breeding and fattening,

perhaps about 30*s.*; and some old leases 1*l.* breeding land."

It is stated that where sheep, in order to fatten them in a more expeditious manner, or to finish them in cases where the grafs is insufficient for the purpose, have the addition of turnips or other sorts of luxuriant green food, great care should be taken, by the grazier, that a due proportion of some sort of dry material be had recourse to at the same time; as without such precaution, not only loss may be sustained by the death of some of the sheep in particular instances, but by their making less progress in becoming fat than would otherwise be the case. Hay, cut chaff, bran, or a few oats, answer the purpose very well. See SOIL-ING.

It is necessary, in order that the consumption of these sorts of food may be conducted in the most economical manner, that proper troughs, racks, cribs, or baskets, should be provided, and fixed in such a way, as that they cannot be overturned. The graziers, in some parts of Lincolnshire, have a large sort of crib or wicker-work basket, being eight or ten feet in circumference, and wattled to the height of one foot or a foot and a half, in a close manner, and then left open for about a foot and a half; after which it is closely wattled again for nearly a foot, being drawn in, in a narrowing manner at the top, so as to have only proper room for introducing the food. The studs or staves are placed about eight or ten inches apart, which admit of the sheep feeding in a distinct manner. It is described in the fourth volume of the first series of the Repertory of Arts, &c. and denominated a *tumbril*. It may be seen at *fig. 8.* in the *Plate on Granaries*. This contrivance affords much advantage, both in the saving of food from being wasted, and in affording the less strong sheep an opportunity of feeding without being disturbed or driven away by the strong ones, and consequently much injured.

In the Rural Economy of the Midland Counties, it is noticed in respect to the practice of grazing in such seasons as are very wet, that an incident of this sort that occurred to the writer in the very wet autumn of 1789 is interesting. "The general complaint is, that grazing stock, though they have this year rolled in grafs, have not done well; Mr. Henton, of Hoby in Leicestershire, being singular in saying, that his feeders had done tolerably. Indeed his stock corroborates his assertion. He had a lot of cows at Loughborough, the 12th of August, the fattest in the show.

"But his management is more remarkable than his success." He "foddered them with hay all the wet weather; that is, he mowed the broken grafs for them, beginning under the hedges, and continuing to mow the coarsest patches throughout the piece.

"The first day (the day it was mown), the cattle seldom touched it; but the second or third day they fell to it freely, eating it "between whites," in preference to grafs. In the morning, it was always the first thing they filled their bellies with.

"The cattle having eaten up the more palatable parts of the herbage, the thistles, and other ossal, were raked up, and carried off the ground: most excellent management!

"This stock consisted of about sixty head. At first one man only was employed in mowing, &c. But, before the rainy weather ceased, he set on another man.

"What an admirable thought! that which other men suffered to stand waste in itself, an encumbrance to the ground, and a nursery of weeds, was converted to food, more nutritious, in a wet season, than the best of the standing herbage."

Mr. Parkinson, of Lincolnshire, had made a practical observation,

servation, which is, that "the less sheep are changed, the better." It demands the farmer's attention, as shewing the injury of folding in many cases. And it is noticed, that the grazing cattle are changed while the business of *hebbing* the fields is performed, and that the sooner this is executed the better; as when the grass tufts are cut while young, the cattle will eat the produce well.

Upon the subject of stocking grazing land, Mr. Marshall remarks, that "the fairs at Birmingham are among the worst in the country for fat stock, the butchers giving the graziers no encouragement to drive their flock to them, preferring the toil of riding twenty, thirty, or perhaps forty, miles from home to pick up their "fat!" spending a principal part of their time and their profits in an employment truly ridiculous. How convenient it would be to the grazier, as well as to the butcher, to have a weekly market, a Smithfield at or near Birmingham! to the grazier, in thereby having a constant and certain market whenever he wanted either keep or money; and, to the butcher, in saving time and travelling expences. Yet the few animals which are taken there at present, are frequently drove out unfold. But Thursday, which is the ordinary market-day, is improper. Monday or Tuesday would be a more suitable day; and Sutton, perhaps, the most suitable place. In performing the business of purchasing in stock, the nearest fairs are always to be preferred, if it can be done there with propriety; as much injury and loss is frequently sustained by driving from a considerable distance.

And the business of grazing other sorts of animals may, in some cases, be a profitable concern, but must always be regulated by the nature of the land and circumstances of the farmer. Where he has a considerable extent of the more coarse sort of pasture-land, he may often find it advantageous to graze young horses, especially where he has the convenience of breeding them likewise. But though it is a practice sometimes followed by grazing farmers, to admit horses in the same pastures with the other stock, it should constantly be avoided as much as possible, as they are very injurious by teasing and driving the fattening cattle about, and preventing their resting so much as is otherwise the case. It is a better method to let them follow this sort of stock. When horses are admitted upon the grazing lands in Somersetshire, it is seldom done in a larger proportion than that of one to twenty acres. But there is another animal which it has long been a practice in particular situations to graze. This is the hog, which, where the farmer has a piece of rich grass, either of the artificial or natural kind, he may turn upon it with much advantage. With clover, and some other artificial grasses, the animals are found to succeed perfectly well in this sort of management; but it is objectionable as losing a vast source of manure of an excellent kind. When the field is so situated as that the hogs can return in the evenings to the well littered sties, it may, however, be a highly beneficial system of practice. There can be no doubt but that this sort of management might be much more extensively employed with this animal, and that thereby much of the food of store pigs might be saved. See Hog.

**GRAZIOSO**, *Ital. Gracioso*, *Fr. graceful*, are terms in *Music*, addressed to the performer; but if the composition is devoid of *grace*, the term can convey no instruction to the performer. It is in vain for the composer to sit down with a resolution to compose a *graceful* movement; it must come unsought, and insensibly.

Marmontel has defined grace in poetry, grace in attitudes, grace in motion, grace in the arrangement of words in prose, of figures in painting, as a polish, a lacquer, a varnish,

a gilding to every human action; without which we may be surprised and entertained, but never perfectly pleased.

No poet, perhaps, abounds in grace and facility so much as Metastasio; for example, see his cantata.

Among musical composers, perhaps, none have been more gifted with this charm than Pergolesi, Sacchini, and Cimarosa.

The time of a *graziando* movement is nearly the same as *andante*; smooth, gentle, and inclined to a somewhat coarse stroke of the bow on the violin, or *drum* on the flute, except, to vary the expression and effect, the composer indicates the contrary.

**GRAZZANO**, in *Geography*, a town of Italy; 13 miles S.S.W. of Verona.

**GRAZZINI**, GIO. PAOLO, of Ferrara, in *Italy*, left the profession of goldsmith to become a painter at an advanced period of his life; his chief instruction he owed to the friendship of Carlo Bononi. The first specimen of his capacity was a picture of St. Eligio placed in the goldsmith's hall of Ferrara. Eight years which he had employed to finish the work were amply redeemed by the display of a master hand, and a tone of colour that placed him near in rank to Bononi, and astonished all Ferrara, who had known Grazzini for half a century. He continued to produce works of less compass, but of equal taste, which are met with in private collections. He died in 1632. Fufel's *Pilgrimage*.

**GRAZZINI**, ANTHONY-FRANCIS, surname *Il Laska*, an Italian writer, was born at Florence in 1593, and is known to posterity as a considerable writer in prose and verse. He is particularly remembered for his light and jocular poems, among which are many of the *Canti Carnaleschi*, or *Carnival Songs*. These, it is said, were first invented by Lorenzo de Medici, and a collection of them was published by Grazzini at Florence in 1559. His other works are as follow: "La Guerra de Mori, poema giocoso," 1584. "Stanze," &c. "Comedie VII;" "Il Laska, Dialogo," &c.; "Lettere," "Orazione," "Rime," *Novelle XI*. The last was an extremely popular work, and as a novelist Grazzini was thought to be a worthy rival of Boccaccio in the elegance of his narration and purity of his style. He was one of the founders of the academy *Della Crusca*. Moreri.

**GREASE**, among *Farriers*, &c. an inflammation and swelling of the heels about the fetlocks, and sometimes of the legs of a horse, as high as the knee or hock, with the secretion of an oily matter, to which the disease owes its name. The matter discharged from the heels has a peculiar offensive smell, and the heels themselves are sometimes ulcerated. Heavy horses, with round fleshy legs, are the most subject to this disorder, and the white legs more than the rest. It is almost always found in the posterior extremities. Grease is occasioned by sudden changes from a cold to a hot temperature, such as the removing of horses from grass into hot stables; from the too sudden change of a generous to an impoverishing diet; from neglect on the part of groomsmen leaving the heels wet and full of sand; and from constitutional debility. On the approach of this disease, and for several days before any very considerable appearances of swelling and inflammation, the animal seems to feel much pain in the situation of the heel, which is indicated by his raising it frequently from the ground, and his not being able to rest upon it without uneasiness. At this early period, the disorder may in general be removed by a poultice of boiled bran and sifted powder constantly applied to the part, and kept moist with warm water; giving every night, or every second night, a mild diuretic. When the inflammation and swelling are consider-

able, the fore-mentioned poultice may be used, and a strong diuretic, or a purgative may be administered as long as the case seems to require it. When the swelling and inflammation have abated, which will commonly happen in three or four days, the poultice may be discontinued, and the following astringent lotion may be applied five or six times a day. Forms of astringent lotion, *viz.* No. 1. Alum powdered, 1 oz., vitriolic acid, 1 dr. and water, 1 pint. No. 2 Alum powdered, 4 oz., vitriolated copper,  $\frac{1}{2}$  oz., and water, 1 $\frac{1}{2}$  pint. No. 3. Sugar of lead, 4 oz., vinegar, 6 oz., water, 1 quart. In each of these recipes mix the ingredients. Some alteration may be necessary, according to circumstances, in the strength of these lotions. Where the inflammation and irritability of the part are considerable, they must be diluted with an equal quantity of water; but if the inflammation be subdued, and a swelling and ulceration remain, the alum solution cannot be made too strong. If the heels be ulcerated, and especially if they appear foul and have an offensive smell, one or other of the following astringent ointments should be applied to the ulcers, *viz.* No. 1. Hog's lard, 4 oz., oil of turpentine, 2 dr., and water of acetated litharge,  $\frac{1}{2}$  oz. No. 2. Venice turpentine, 1 oz., hog's lard 4 oz., and alum finely powdered, 1 oz. Mix the respective ingredients. If the ulcers be deep, and do not readily heal, they should be washed with the detergent lotion previously to each dressing. Regular exercise on clean and dry ground is of the highest importance. In slight cases of grease, the astringent lotion and a few diuretic balls will generally effect a cure; but if the disease is of long standing, and more especially if the horse has had it before, it will be more difficult to remove it. In such cases an alterative powder, composed of powdered resin and nitre of each 4 ounces, mixed and divided into 8 doses, should be given in the corn every day, until it produces a considerable diuretic effect. In very obstinate cases, rows in the thigh have been found useful. Digitalis, or fox-glove, has been recommended in those swellings of the legs which are the consequences of grease; but as this is a violent medicine, and apt to injure the stomach, it should be cautiously administered; the dose is from half a dram to one dram. When a horse has suffered much from this disease, and appears to be weak and out of condition, a liberal allowance of corn will tend to recover him, especially if it be assisted by the astringent lotion, and careful grooming. In cases of this kind exercise is indispensible. When the disease depends upon debility it is obvious that a dose of physic would be improper; but considerable benefit has sometimes attended the exhibition every morning, till the bowels are moderately opened, of the following alterative; *viz.* siccotrine aloes, 1 oz., castile soap, 1 $\frac{1}{2}$  oz. powdered ginger and myrrh, of each  $\frac{1}{2}$  oz. Form these into a mass with syrup, and divide it into six balls. This medicine, though of an opening quality, will improve the horse's strength, and at the same time promote absorption. Or the following preparation may be administered: *viz.* antimony, finely powdered, and flowers of sulphur, of each 6 oz.; linsced powder, 2 oz.; and honey sufficient to form a mass for 12 balls: one of which may be given once or twice a-day.

Nothing tends so much to prevent grease and swelling of the legs as frequent hand-rubbing, and cleaning the heels carefully, as soon as a horse comes in from exercise. In inveterate cases of grease, where the disease appears to be in some degree habitual, a row at grass is the only remedy. If a dry pad lock can be procured where the horse may be sheltered in bad weather, it will be found very convenient: for thus circumstanced the horse may perform his usual labour, and be kept free from the complaint. In the earlier stages of the disease, the practice of tarring the horse into a salt-

marsh is serviceable: and a few months' run on a salt-marsh has frequently eradicated the disorder, when other remedies have failed. Obstinate cases of grease may very frequently be cured by withholding the horse's allowance of water for two days, or even a longer time, and then riding him into the sea or salt water, when his thirst will induce him to drink freely; and the salt water will act as an useful laxative and alterative. This process must be frequently repeated, whenever it does not appear to be injurious in any material respect. In a few obstinate cases, Mr. White says, (Treatise on Veterinary Medicine,) that he has seen the mercurial alterative of service, giving one ball every morning, until the bowels are opened: it is formed of calomel,  $\frac{1}{2}$  dr., aloes, 1 dr., Castile soap, 2 dr., and oil of Juniper, 30 drops, made into a ball with syrup for one dose. In the treatment of those ulcers, or "cracks," as they are often termed, which particularly occur in the back part of the pastern, and which are of difficult cure, cleanliness is of great importance; and when they appear inflamed and painful, it will be useful to apply a moist poultice, in which a little Goulard has been mixed, for two or three days. The following ointment, *viz.* fresh hog's lard, 4 oz. and white lead finely powdered, 1 oz. mixed, may then be applied, spread on tow, and secured with a light thin bandage. If cracks or ulcers appear in the heels, without that general swelling of the legs and discharge of matter, which constitute the disease named grease, they may be soon cured by applying the astringent ointment, and giving a few doses of diuretic alterative: but when these are accompanied by the grease, laxatives or purgatives are proper, according to the condition of the animal. The astringent ointment is made of hog's lard, 4 oz. palm oil, 2 oz. and fine olive oil, 1 oz. melted by placing the pot which contains it in boiling water, and, when melted, stirring in 1 $\frac{1}{2}$  oz. of the water of acetated litharge, and continuing to stir it till the mixture is nearly cold. If the ulcers are deep, the horse should be kept in the stable till they are nearly healed, with a cooling opening diet; and his legs should be frequently and briskly rubbed with the hand; and a few of the diuretic alterative powders should be given. When proud flesh, as it is called, appears in the ulcers, it must be destroyed by caustics, such as blue vitriol powdered, or dissolved in warm water, or bear caustic. When this is neglected, they sometimes increase to a large size, and become almost of a horny consistence, in which state they are commonly named "grapes."

In recent cases of grease, in which the heels are inflamed and swollen, and discharge a whitish-coloured matter, much benefit has resulted from fomenting them for a considerable time with warm water, in which a small quantity of Goulard has been mixed, and immediately applying the Goulard poultice. In obstinate cases of grease, where the matter discharged is very solid, the fomenting poultice is useful, that is, a poultice of linsced meal, warm water, and yeast, which soon removes the offensive smell, and causes a less acid matter to be formed. Powdered charcoal has also been recommended for the same purpose. In recent cases the Goulard poultice and mild purgatives will soon reduce the inflammation considerably; and when the cure is easily accomplished by astringent lotions. For preventing a return of the complaint, exercise and good grooming are indispensably necessary; frequent hand-rubbing of the legs, and a diuretic powder occasionally, are also useful. Horses with white hinder legs, or such as are much disposed to swelling of the legs, should be bandaged for some time, particularly after hard work, keeping the bandage constantly moist with a solution of alum and water. In some cases of grease the inflammation seems to extend to the cellular membrane under the skin, the consequence of which



which is a more severe pain and lameness than when it is superficial. The inflammation generally terminates in an abscess of the heel, which bursts and leaves a deep ill-looking ulcer. Although the general swelling of the legs subsides, the ulcer is extremely irritable, and healed with difficulty, particularly if the horse be exercised. By applying poultices and warm digestive ointment, and by keeping the horse at rest, the ulcer gradually heals. When ulcers of the heel do not appear disposed to heal, the astringent ointment above-mentioned should be changed for the following, which is more stimulant, and, previously to its application, the sore should be washed with a solution of blue vitriol. The stimulating ointment is prepared by mixing ointment of yellow resin, 4 oz. olive oil  $\frac{1}{2}$  oz. and red nitrated quicksilver in fine powder  $\frac{1}{2}$  oz. See White's Treatise of Veterinary Medicine, vol. 1.

If the greafe be an attendant of some other disease, it will be in vain to attempt the cure before the disease be removed, that is the original cause of it; and therefore, if it be a hectic, the yellows, or the farcin, &c. the directions given for those diseases are to be followed, and in the mean time proper applications are to be used outwardly for the greafe.

**GREASE, Molten**, a disease of the intestines, incident to horses, and generally dependent on some constitutional affection. Horses that have been well fed, without much exercise, are peculiarly subject to this complaint: although they appear sleek and fat, they are not fit for violent or long-continued exertion, unless they have been brought to it gradually: and therefore when they are put to work in this state, and violently exercised, a fever often ensues; and this fever commonly depends upon general inflammation or increased action of the whole arterial system. In this disease, nature makes an effort to remove it by a violent purging; and the mucus, formed on the inner surface of the bowels for the purpose of lubricating and protecting them from the action of any acrimonious matter that may happen to be passing through them, being now more abundant, appears somewhat like fat mixed with the dung. When blood is drawn from a horse in this state, a large quantity of inflammatory crust, coagulable lymph, or bail-coloured jelly, appears on its surface. Such is the account which Mr. White gives of this disease, and he explains the account of those veterinary writers who represent molten greafe as consisting in a coagulation or general melting of the fat of the body, great part of which is absorbed, and thrown upon the blood and upon the intestines, whence it is voided with the excrement. Nor does he approve of the description of this disease, given by Mr. Blaine, in his Treatise on Veterinary Medicine, who considers it to be the same with the human dysentery. In the course of a ten years' extensive practice, he says that he has never met with a single case that resembled the dysentery described by medical authors. "I have often observed," says this writer, "during the progress of symptomatic fever, internal inflammation, mucus mixed with the dung, which had sometimes the appearance of part of one of those long white worms so often found in the horse's bowels; at others it resembled a membrane. I have observed the same thing in horses apparently healthy, or after the operation of very strong physic. I have also seen many cases where there was tenesmus or considerable irritation in the rectum; the horse frequently voiding a small quantity of dung, and appearing in pain. But this was always a symptom of some more important complaint, and easily removed, or the effect of physic, and very unlike dysentery." Molten greafe, according to Mr. White, is not to be considered as a distinct disease, but merely as a symptom, sometimes appearing in general inflammation, but more frequently in fevers. In either of these cases some of the internal organs are more

affected than others. When a difficulty of breathing occurs, indicated by an unusually quick motion of the flanks and expansion of the nostrils, it is a sign of an affection of the lungs. When molten greafe appears, it shews that the mucous membrane of the bowels is more particularly affected; sometimes both these parts are affected at the same time. The principal remedy in this disease is copious bleeding, according to age, strength, and other circumstances of the case. It is often necessary to repeat the operation of bleeding; and if the disease appears to be principally seated in the lungs, only laxatives should be administered and rowels inserted in the chest and belly; the ribs also may be blistered, or the mustard embrocation rubbed on the sides and belly. In molten greafe, or when the bowels are affected, if a copious purging occurs, it should not be suppressed, but encouraged, by giving frequent decoctions of linseed, gum arabic dissolved in water, starch, or the powder of arrow root, and boiled in water. When the dung is voided sparingly, but frequently, and particularly when any knobs are mixed with it, let a pint of castor oil be given, which may be repeated, if necessary, about two days. In this case it will be proper to rub the mustard embrocation on the belly. If the disease continue, and especially if there be considerable irritation about the anus; the horse frequently ejecting a small quantity of excrement, and appearing to be in great pain, the following opiate clyster may be given, viz. opium ʒi dram, water 8oz mixed, to which add about a quart of water; water, i. e. starch boiled in water, of a proper consistence for a clyster. If the exhibition of a clyster seems rather to increase than alleviate the pain and irritation, the use of castor oil must be repeated, and a clyster thrown up only of water or gruel or a little oil. As the gut in this case is very tender and irritable, the clyster pipe should not be rough, and it should be introduced with caution; it should therefore be perfectly smooth, covered with oil or lard, and not protruded with violence. It is probable, says Mr. White, that a small, short tube of bone, about three times the bulk and length of the pipe used in human subjects, would be preferable on this occasion to that which is commonly employed. White's Treatise of Veterinary Medicine, vol. 1.

**GREASE, among Hunters**, denotes the fat of a horse or hare.

**GREAST**, in *Agriculture*, a term provincially made use of to imply any thing foul, whether in animal or land. It is frequently used to signify such tillage lands as are much over-run with grubs when in the state of fallow.

**GREASY-Blind**, or *Croaky-Blind*, in *Agriculture*, a term by which kind shale or slate clay, or that which has a greasy appearance, and works or digs easily, is distinguished. See SHALE.

**GREAT**, a term of comparison, denoting a thing to have more extension than some other to which it is referred. Thus we say, a great house; a great distance; a great figure, a great body, &c. See COMPARISON.

**GREAT** is likewise used figuratively, in matters of morality, &c. to signify ample, rich, elevated, extraordinary, important, &c. Thus we say, St. Katherine was a great genius; queen Elizabeth had a great ability; Cromwell was a man of great genius; Davy was a great philosopher; Galileo a great philosopher; Bacon a great statesman, &c.

**GREAT** is also a title of quality appropriated to certain princes, and other illustrious persons. Thus we say, the great Turk; the great Mogul; the great Khan of Tartary; the great duke of Florence, &c.

**GREAT** is also a surname bestowed on several kings and emperors. Thus we say, Alexander the great, Cyrus the great; Charles the great, or Charlemagne; Henry the great

of France, &c. So the English frequently say, Edward the great, or the great Edward; William the great, meaning king William III. or the great William. The French say Louis the great, *le grand*, speaking of Louis XIV. Giles of Paris says, Charlemagne first got the surname great from the tallness and eminence of his stature. Helgaud adds, that Hugh the great of France was thus denominated on account of his great piety, goodness, &c.

GREAT is also applied to several officers who have pre-eminence over others. Thus we say, the lord great chamberlain; the great marshal of Poland, &c.

GREAT *Circles of the sphere.* See GREAT CIRCLE.

GREAT *Circle sailing.* See SAILING.

GREAT *Apparatus.* See APPARATUS.

GREAT *Artery.* See ARTERY.

GREAT *Bairam.* See BAIRAM.

GREAT *Bank of Newfoundland.* in *Geography.* See BANK. It lies between  $41^{\circ}$  and  $50^{\circ} 24'$  N. lat., and between  $49^{\circ} 45'$ , and  $54^{\circ} 45'$  W. long.

GREAT *Barrington.* See BARRINGTON. The number of inhabitants by a late estimate is 1754.

GREAT *Bay*, a bay of North America, at the mouth of the Piscataqua river, between Portsmouth and Exeter, in the state of New Hampshire.

GREAT *Bear lake.* See BEAR lake.

GREAT *Bear.* See URSA major.

GREAT *Cape*, in *Geography*, a Cape of Upper Canada, where lake Superior descends into the narrows of the fall St. Mary.

GREAT *Diachylon.* See DIACHYLON.

GREAT *Egg harbour*, &c. in *Geography.* See EGG harbour river.

GREAT *Famine*, a river of America, in New York, which rises in the mountains near the source of the river Oncida, and runs N. W. by W. to lake Ontario.

GREAT *Gun.* See CANNON and GUN.

GREAT *Intervals*, in *Music*, signify the same, with Holden and some other writers, as greater and major do with the generality of musicians, and is applied to the intervals marked with Roman capitals, as II, III, V, VI, VII, &c. See GREATER.

GREAT *Island*, in *Geography*, a small island in the East Indian sea, near the N. coast of the island of Flores. S. lat.  $7^{\circ} 59'$ . E. long.  $120^{\circ} 54'$ .—Also, an island in the river Niagara, between lake Erie and lake Ontario. N. lat.  $53^{\circ}$ . W. long.  $78^{\circ} 59'$ .—Also, an island of Ireland, in the county of Cork, being the largest of the islands formed by the river Lee in Cork harbour; on it is the flourishing town of Cove.—Also, an island in Piscataqua harbour, New Hampshire, in the United States.

GREAT *Kanharway.* See KANHAWAY.

GREAT *Letters.* See CAPITALS.

GREAT *Mass.* See MASS.

GREAT *Mecatina.* See MECATINA.

GREAT *Octave*, in *Music*, is applied by the Germans, according to their tablature, or notation of musical notes, to the octave, or rather septave, beginning with C on the second leger line below the bass staff, and ending with B on the second line, or *mi* of Guido, and to which they exclusively apply the Roman capitals C, D, E, F, G, A, B. See Dr. Calcott's *Musical Grammar*, art. 34. See also SMALL OCTAVE, ONCE-MARKED *Octave*, and TWICE-MARKED *Octave*.

The object of this tablature is, to enable musical notes to be written or printed without clefs or lines and spaces in a staff.

GREAT *Officers.* See OFFICER.

GREAT *Pelican Island.* See PELICAN.

GREAT *Repeat.* See REPEAT.

GREAT *Ridge*, in *Geography*, one of the ridges of the Alleghany mountains, which separates the waters of the Savannah and Alatomaha. At the S. E. promontory of this ridge is that extraordinary place called Buffalo lick, distant about 80 miles from Augusta. It occupies several acres of ground. A large cane swamp and meadows, forming an immense plain, lie S. E. of it, and in this swamp Mr. Bartram apprehends that the branches of the great Ogechee take their rise. The lick is nearly level, and lies between the head of the cane swamp and the ascent of the ridge.

GREAT *River*, a river of Virginia, which runs into the Staunton river. N. lat.  $36^{\circ} 46'$ . W. long.  $79^{\circ} 12'$ .—Also, a river of Canada, which runs into the river St. Lawrence, 20 miles below Quebec.

GREAT *River.* See RIO GRANDE.

GREAT *Scale*, in *Music*. The late sir Marmaduke Overend, after a life almost spent in researches into the nature and proportion of musical intervals, succeeded, to the satisfaction of Dr. Boyce, his intimate friend, to whom his labours were submitted, in unravelling the mysteries of the Greek scales of music, as he says, in a paper on the great scale, in his quarto manuscripts, vol. ii. page 113 to 133, now in the library of the Royal Institution, which is thus entitled, *viz.* "All the Greek scales of music combined, with the diatonic intense, extended in the acumen and gravitas, with their remissions and intensions to double flats and double sharps in each; first restored, elucidated, and calculated, by Marmaduke Overend, Isleworth 1779." In pages 143 to 149 of the same volume of MS. we find also the several ratios of this scale in their least terms, and the indices of the component primes, of one octave of the acumen and the gravitas with the synemmenons, the remissions, &c. This scale, which contains 86 notes within the octave, is a great musical curiosity, which we are sorry that our limits will not admit of inserting: by the notice here taken of it, the curious may resort to the manuscripts themselves for further satisfaction. See GREEK SCALE.

GREAT *Seal.* See SEAL.

GREAT *Sixth, Redundant*, in *Music*, or redundant great sixth, according to Holden, is the inversion of the deficient less third of his scales ( $\frac{2}{3}$ ), and has a ratio of  $\frac{7}{6}$ , =  $475.947592 + 9f + 41m$  in Farey's notation, its common logarithm being .7659167.9396, its Euler's log. or decimal of the octave = .7776075, and it contains 43.38868 major commas. This interval does not belong to the received or diatonic system, having the number 7 in its ratio.

GREAT *Sodus.* See SODUS.

GREAT *Third*, in *Music*, probable, according to Holden's new and fanciful system, is the ratio which the mind "probably" conceives (page 371 of his "Essay") as pertaining to the major third in the common chord minor, and to which he assigns the numbers  $\frac{1}{3}$ , =  $206.2709822 + 4f + 18m$  in the new notation; its common logarithm is .8985423 5924 and that of Euler, .3370350, it also contains 18.80576 major commas; it is far removed from the received or diatonic system of intervals, as involving the prime number 19, and yet it is one of those which result from earl Stanhope's directions for tuning; it is the lesser equal-beating biequal third of his lordship, see EQUAL BEATING. Mr. Holden, at page 384 of his essay, relates an experiment in which this third proved an "intolerable discord," which is more than might be expected, from the temperament of rather more than  $\frac{1}{8}$ ths of a comma, which it has.

GREAT *Tithes.* See TITHES.

GREAT *Wardrobe.* See WARDROBE.

**- GREAT Wheel**, in *Clock* or *Watch-work*, is that wheel which the weight, spring, or fusee, first moves.

**GREAT Work**, in *Chemistry*, is the alchemical process whereby gold is made, or pretended to be made.

**GREAT Year**. See *PLATONIC year*.

**GREATER Barons**. See *BARON*.

**GREATER Enharmonic diefis**. See *DIESIS*.

**GREATER Excommunication**. See *EXCOMMUNICATION*.

**GREATER Fasti**. See *FASTI*.

**GREATER Hexachord**. See *HEXACHORD*.

**GREATER**, in *Musick*, is applied to distinguish several intervals, whereof there are two of the same name, as greater second, lesser second; greater third, lesser third; &c. Major interval is as often applied to these, and by some few writers they are called great intervals. The semitone or difference between the *greater* and the *lesser* intervals of the same names, are not all equal, but of two different magnitudes, viz. the semitone minor ( $\frac{1}{2} \sharp = 36 \Sigma + f + 3 m$ ), which occurs between the thirds and the sixths major and minor, and the semitone medius ( $\frac{1}{2} \natural = 47 \Sigma + f + 4 m$ ), which occurs between the seconds, fourths, fifths, and sevenths, major and minor: the difference of these semitones being the major comma  $\frac{2}{3} \flat = 11 \Sigma + m$ .

**GREATHAM FLEET**, in *Geography*, a river of England, which rises in the county of Durham, and runs into the German sea, 5 miles S. of Hartlepool. N. lat. 54° 43'.

**GREATMAN'S BAY**, a bay of Ireland, on the N. coast of Galway bay; six miles N. from S. Arran isles.

**GREAVES, JOHN**, in *Biography*, was born at Colmore, near Alresford, in Hampshire, in the year 1602. He was educated in the classics, and in the other elementary parts of learning by his father, who was rector of the place, and the most celebrated school-master in that country. When he was fifteen he was sent to Baliol college, Oxford, where he applied himself with great assiduity to the studies of the place, and took his first degree in the year 1621. Three years after this he stood candidate for a fellowship of Merton college, when he was the first on the list of five who were then elected. In 1628 he took the degree of M.A., and more particularly directed his attention to the study of the mathematics and oriental learning, and became the friend of the most eminent scholars in the university, among whom were Mr. Briggs, Savilian professor of astronomy, and Mr. Peter Turner, professor of geometry in Gresham college, London. Had he wanted any motive to induce him to pursue his studies with vigour, the example of his contemporaries would have furnished that motive. Mr. Greaves read over all the writings of the most celebrated mathematicians of that and the preceding age, and he made himself familiar with the ancient Greek, Arabian, and Persian authors. In the year 1630, upon the resignation of Mr. Turner, he was elected professor of geometry at Gresham college, in consequence of the high reputation which he sustained in the university. At this period he was introduced to archbishop Laud, the chancellor of the university of Oxford, from whom he received several marks of favour. Soon after this, Mr. Greaves resolved to travel for improvement, and in 1635 we find him in Holland, attending the lectures of James Golius, professor of Arabic at Leyden; from thence he proceeded to Paris; afterwards to Rome, Florence, and Padua, making exact observations upon everything deserving of notice. Upon his return he determined to take a voyage to Egypt, a design which met with the decided approbation of the archbishop. His object in this was not only to make himself acquainted with such remains of antiquity which that far-famed country possessed as might serve to illustrate ancient literature, but also to make

astronomical and geographical observations; he therefore furnished himself with instruments of every kind for the purpose, and such printed Greek and Arabic books as he thought might be advantageously exchanged for MSS. and other objects worthy of collection. He embarked at Dover for Leghorn in the year 1637, accompanied by his friend Mr. Edward Pococke, and proceeded first to Italy, and thence to Constantinople, where they arrived about Michaelmas. Here he was received with great attention by sir Peter Wyche, to whom he brought out letters of commendation from archbishop Laud. He was immediately introduced to Cyril Lucar, the Greek patriarch, who afforded him much valuable assistance in purchasing Greek MSS. The venerable patriarch promised to recommend him to the monks of mount Athos, in Macedonia, where, he said, "he would have had the leisure of entering all the libraries in that place, to have collected a catalogue of such books, as either were not printed, or else, by the help of some, these might have been more precisely set out." These, by dispensing with the anathemas which former patriarchs had laid upon all Greek libraries to preserve the books from the Latins, the patriarch proposed to have presented to the archbishop of Canterbury, for the better prosecution of his grace's designs in the edition of Greek authors, but the death of that patriarch frustrated Mr. Greaves' intention of visiting the celebrated mount, and occasioned his being a sufferer in another respect; for having procured from a Greek monastery some MSS. of the fathers, he was under the necessity of referring them, and losing his money to avoid a greater inconvenience. Mr. Greaves, having lost his friend, determined to proceed to Egypt, but before his departure he had an opportunity of shewing his great attention to astronomical science: knowing that there would be an eclipse of the moon in the course of a few months, he furnished proper persons with convenient instruments for observing it at Constantinople, Bagdad, Smyrna, and Alexandria, and gave them necessary instructions for the purpose. For his conduct in this respect Dr. Halley paid him the highest compliment by saying that a greater service could not be rendered to the science of astronomy than by taking the phases of the moon's eclipses at those places, in order to determine their longitudes, since in and near them were made all the observations by which the mean motions of the sun are limited. Mr. Greaves having finished his arrangements for this business, went by Rhodes to Egypt, and arrived there in the month of September 1638. This was the boundary of his intended journey, and here an immense field for the exercise of his inquisitive genius opened upon his view. He omitted no opportunity of examining whatever the heavens, the earth, or subterraneous parts offered him, that might be deserving of notice; but complains of having his astronomical observations frequently interrupted by the clouds and rain, which he found to be frequent, especially in the middle of winter. But what particularly engaged his attention, and employed his care, were the pyramids, of which, at that time, there was no satisfactory account before the public. This task he undertook, and towards the close of the year 1638 he took a careful survey and mensuration of them. Having gratified his curiosity, furnished his mind with a large stock of useful knowledge, and collected some Greek, Arabic, and Persian MSS., as well as ancient coins, and other varieties, he embarked at Alexandria in the month of April 1639, and arrived at Leghorn in June. He now made a second tour of Italy, which occupied him nine months. At Florence he was received with particular marks of respect by the grand-duke of Tuscany, Ferdinand II., to whom he addressed a Latin poem sent from Alexandria; and he also was permitted to

have

have free access to the Medicean library, which had been refused to him as a stranger when on his former tour. From Florence he went to Rome, whence he returned to Leghorn, and embarked on board a vessel for London, with a rich cargo of MSS., gems, coins, and other valuable antiquities. Upon his arrival in England he found his native country distracted by the contests between the king and parliament: he was, from principle, a friend to the royal party, and involved himself in much trouble by the zeal which he displayed in the cause of monarchy, and in his attachment to archbishop Laud. Having made a short stay at Gresham college, he went to Oxford to digest and prepare his papers for publication, in which he was assisted by archbishop Uther, who had long known and esteemed him; and he now drew a map of the Lesser Asia, at his grace's request, who was writing his dissertation on that country, which was printed in 1641. In this year archbishop Laud having presented to the university a second collection of medals, the task of arranging them was confided to Mr. Greaves, which he performed to the entire satisfaction of that learned prelate. By continuing to reside so long at Oxford, Mr. Greaves lost his professorship at Gresham college, but he was almost at the same time chosen the Savilian professor of astronomy at Oxford, and obtained likewise a royal dispensation to hold his fellowship at Merton college, on account of the diminution in his stipend as professor, arising from the circumstances of the civil war. The labours of the professorship being suspended, he proceeded with his literary avocations, and in the year 1644 translated into Latin the "Lemmata of Archimede," correcting the diagrams, and supplying what was frequently found defective in the demonstration itself. This piece was published by Mr. Samuel Fuller in his Miscellanies, or "Mathematical Lucubrations," 1659. Mr. Greaves, about the same time, compiled "A Persian Lexicon," out of such words as could be met with in the evangelists, the psalms, and two or three Arabian and Persian nomenclators. In 1645 he drew up a scheme for gradually introducing the new Gregorian style, by omitting the intercalary day of the leap-year for forty years, which scheme was highly approved by the king and council, and would probably have been carried into execution, had the times been favourable to the innovation. In 1646 he published his work entitled "Pyramidographia," or a description of the pyramids of Egypt, and soon after a "Discourse on the Roman Foot and Denarius," from whence, as from a common standard, the measures and weights used by the ancients may be deduced. About the year 1648 Mr. Greaves found that he should be under the necessity of resigning his professorship, he accordingly, before his interit was entirely gone, introduced a successor, viz. Mr. Seth Ward, afterwards bishop of Salisbury. He then went to London, where he married, and living upon his patrimony, devoted his time to literary labours. He published many learned works, among which was "Elementa Linguae Persicae," 4to. to which the author subjoined "Anonymus Persa Sighis Arabum et Perfarum Astronomicis." In 1652 he published an astronomical work, to which he prefixed "A short History of the Rise and Progress of Astronomy among the Arabians," and subjoined his Bine Tabule. Besides these, he published many other works, and had prepared many more for the press, when he was attacked by a disorder that proved fatal to him. He died in the fiftieth year of his age. Of his learning, ingenuity, diligence, and wonderful perseverance, there is abundant evidence. He was highly esteemed by many of his most eminent contemporaries both at home and abroad; steady in his principles and in his friendships, and his death was lamented as a real loss to science and literature. *Biog. Brit.*

**GREBANISH HEAD**, in *Geography*, a cape of Scotland, on the E. coast of the peninsula of Harris. N. lat. 57° 48'. W. long 6° 43'.

**GREBE**, in *Ornithology*, is classed by Linnæus under the genus of *Colymbus*, which see.

**GREBENAU**, in *Geography*, a town of Germany, in the principality of Hesse Darmstadt; 35 miles S. of Cassel. N. lat. 50° 43'. E. long. 9° 31'.

**GREBENSKOI** See **COSSACKS**.

**GREBENSTEIN**, a town of Hesse-Cassel, 12 miles N.W. of Cassel. N. lat. 51° 26'. E. long. 9° 22'.

**GREBER**, **GIACOMO**, in *Biography*, a German musician, who had been some time in Italy, and who brought thither a female singer, his scholar, la signiora Margarita de Pessine. He set to music a pastoral entertainment, entitled "The Loves of Ergasto," after the manner of the Italian opera, that is, in recitative, with airs intermixed. This was the first performance in Sir John Vanburgh's new theatre in the Haymarket, afterwards called the Opera House. Greber's scholar, Margarita, sung in most of the early attempts at operas in England, and from the name of her master, Greber, was long called "Greber's Peg;" which occasioned his name to be better known, and longer remembered than his works. See **MARGARITA**.

**GRECI**, in *Geography*, a town of Naples, in the province of Principato Ultra, founded by a colony of Albanians, who left their country after their prince George Castriot, near Ariano.

**GRECOURT**, **JOHN-BAPTIST JOSEPH VILLART DE**, in *Biography*, was born at Tours, in France, in 1683. He was devoted by his friends to the church at a very early period, and was in possession of a canonry when he was only fourteen years of age. He became celebrated as a preacher, but his discourses were satirical rather than moral, and did not redound much to his credit as a preacher of the gospel. Quitting his profession he became a man of the world, and made his way to the fashionable circles by his convivial talents, and his faculties of writing and reciting licentious and burlesque verses. He was patronized by the marshal duke d'Etrees, who frequently carried him to his seat, which the poet called his earthly paradise. The life which he led would not bear reflection; and though he apparently spent a joyous course, yet there was a small portion of respectability attached to his character. He died in 1743. His printed works were tales, epigrams, songs, fables, and other light pieces. Few of them rise above mediocrity, but they are lively, pleasant, and popular. His poem, entitled "Philotanus," which was a satirical history of the bull Unigenitus, had prodigious success. The verses are burlesque, some of them extremely humorous, though their general texture is mean and vulgar. *Moreri*.

**GREDDING**, in *Geography*, a town of Germany, in the principality of Aichstatt, on the Schwarzach; 13 miles N.E. of Aichstatt.

**GREE**, a town of Persia, in Segestan; 20 miles S.W. of Meineud.

**GREE**, in our *Laws Books*, signifies agreement, contentment, or good liking. Thus, to make *gree* to the parties, is to satisfy them for offence done. "Judgment shall be put in suspense, till *gree* be made to the king of his debt." Stat. 25 Edward III.

The word is formed from the French *gré*, *good will*, *good liking*, or *allowance*.

**GREECE**, in *Geography*, a country of Europe, subject to the Turks, and more generally known under the name of *Turky in Europe*, which see.

**GREECE**, in *Ancient Geography*. See **GRÆCIA**.

GREEK Accents. See ACCENT.

GREEK Bible. See BIBLE.

GREEK Church. See CHURCH.

GREEK Church, *Musiq. of the*. The schism between the Greek and Roman churches, which happened in the ninth century, prevented such changes as were made in the Roman ritual, after that period, from being adopted by the Greeks; and the notation used before seems long to have continued in the East. In Russia, however, all the rituals were called in at the beginning of the last century; and a uniform liturgy was established, in which the modern method of writing music was received. But in the Greek isles a notation peculiar to its inhabitants is still in use, which is not only as different from our's as their alphabet, but totally unlike that in the ancient missals.

In examining the most ancient of these in the Vatican library, which were written in capitals, the first notation which we could discover, consisted chiefly of accents; and when small letters were afterwards used, these accents were only somewhat lengthened. In the tenth and eleventh centuries, they very much resemble the characters to be found in contemporary Latin missals. However, the melodies in the lower ages became more elaborate, and the notes more numerous than in those of higher antiquity.

St. John Damascenus, who lived in the eighth century, is celebrated by the writers of his life, and by ecclesiastical historians, as the compiler and reformer of chants in the Greek church, in the same manner as St. Gregory in the Roman. And Leo Allatius (*De Libris Eccl. Græcorum* under the title "Ὀκτώσχος" (*ὀκτώσχος*; eight tones), tells us they were composed by J. Damascenus. Zarlino goes still farther, and informs us (*Instit. Harm. 4to. parte. cap. viii.*) that in the first ages of Christianity the ancient Greek notation by letters having been thrown aside, John Damascenus invented new characters, which he accommodated to the Greek ecclesiastical tones; and that these characters did not, like our's, merely express single sounds, but all the intervals used in melody; as a semitone, tone, third minor, third major, &c. ascending and descending, with their different duration. This resembles, in many particulars, the notation in the ecclesiastical books of the Romish church, before the time-table, and characters in present use were invented, or, at least, generally received.

The abate Martini of Venice (see "Present State of Music in France and Italy") having visited the Greek isles in hopes of acquiring such a knowledge of the music practised there at present, as would enable him to judge whether any of the miraculous powers attributed to it by their ancestors still remained, as well as to compare its excellence with that of his own country; and as this learned and sagacious enquirer confided to us his papers on that subject, we shall communicate to our readers a sketch of their contents.

The system of modern Greek notation seems much more complicated and obscure than the ancient. The characters convey nothing to the mind either by their form or names, the greater part of which cannot be construed; and the rest are construed to no purpose. Their signification, as words, does not point out their meaning as musical characters; and all that we can discover is, that some of them seem descriptive of gesticulations; such as *ἀναίστησις*, which, perhaps, directed the priest to look up, or stretch his hands towards heaven. *ὀρθοστάσις*, which might direct him to make the sign of the cross, or to carry the cross. *ἁγιοστάσις, flexio, contortio*. Indeed, it is said in the papers, that some of these characters are for the *Χαροποιία*, or *Igerdemain*, and not

*ἀναίστησις*, for the *voice*. This is the more likely, as the Greek service abounds in gesticulations and manual dexterity.

The abate was informed, that though the oriental Greeks have signs for musical sounds equivalent to our's, they sing more by tradition than science. However, the distinctions for the duration of sounds, such as our time-table *Sanctæ*, are still wanting. The abate procured an extract from a tract upon the music of the modern Greeks, written by Lampadius; but who he was, or when he lived, no one could inform him. In this it appears, that the characters amount to more than fifty; among which most of the names of those musical terms, given by Du Cange, from a MS. treatise on the ecclesiastical music of the Greek, are to be found. (*Gloss. Med. et Inf. Græcitat.*) Du Cange, who has so amply collected and explained the characters used by the modern Greeks in church, botany, astronomy, and other arts and sciences, is silent as to their musical notation; nor have we been able to acquire any information on that subject, except that which the abate Martini has supplied us. The title of the treatise by Lampadius is the following: *Ἐπιτομὴ τῆς μουσικῆς τῆς ἁγιωτάτης ἐκκλησίας*. The extract from it, which is in our possession is too long for insertion here; nor would it be of much use, could we allow it room, as no equivalents to the Greek characters are to be found in our own notation. But with respect to the author, we find among the memoranda which we made in the king of Sardinia's library at Turin, an account of a Greek MS. of the fifteenth century, N. 353 b. 1. 24, in which Lampadius is often mentioned as author of the music to the hymns and prayers it contains. Fabricius likewise, *Bibl. Græc. vol. ii. p. 269, 564*, and 586 speaks of a MS. in the Selden collection at Oxford, and another in the Jesuits Library at Louvain, in which there are explanations of the notes used by the modern Greeks, and musical compositions by several authors, particularly Lampadius. In the patriarchal church of Constantinople there are four singers, who are placed on the right and left sides of the choir; the first on the right is called *ἡγεμῶνας*, the principal singer; the first on the left *ἀναστάσις*, Lampadius; the two others who assist the principals are called *δομῆσις*. It is probable that Lampadius, who flourished about the year 1300, either took his name from the office he filled; or, on account of his eminence in music, that his name was given to the office.

To insert here the musical characters still used in the rituals of the Greek church out of Russia, and endeavour to explain them, will perhaps be conferring but a small favour on our readers; for from the scarcity of music written in such characters, so few will be their opportunities of making use of any knowledge they may acquire by the study of them, that it would be like learning a dead language in which there are no books, or a living language without the hopes of either reading or conversing in it.

Those readers who may be desirous of gratifying themselves in matters of curiosity, may consult Dr. Burney's *History of Music*, vol. ii. p. 52, where they will find the fourteen musical characters that occur in the Greek MSS. of the Evangelists, written in capitals during the seventh, eighth, and ninth centuries, though at present they are wholly unintelligible, even to the Greeks themselves. It is observable that the more ancient the MSS. the fewer and more simple are the notes; the "Codex Alexandrinus" in the British Museum has none; and the Evangelist MSS. in the Harleian collection, 5785, 5598, both of the tenth century, have only such as these, which were copied in Greece by the abate Martini.

The "Codex Ephrem," in the king's library at Paris, of the fifth century, has likewise the same kind of musical notes, and it is assigned as a reason for the "Codex Alexandrinus" not having them, that it was written for private use, not for the service of the church.

Kircher undertakes to give his reader an idea of modern Greek music and its characters; and has indeed collected a great number of notes and their names, but pretends not to furnish equivalents in the music of the western world. And to insert such barbarous names, and more barbarous characters here without explanation, would no more help to initiate a student in the mysteries of Greek music, than the Hebrew or Chinese alphabet. At the first glance they very much resemble the characters used in Choregraphy, an art invented about two hundred years ago to delineate the figures and steps of dances. They are too numerous and complicated to be inserted and explained here; however, we have given the names and correspondent notes in the History of Music, vol. ii. p. 51—52, by the study of which the musical reader will be able to form some idea of the melody which they are intended to express.

There are eight ascending, and six descending characters, some for single sounds, and others for wider intervals, as thirds and fifths, such as Zarlino, in the passage mentioned above, had imagined were invented by J. Damascenus; and all these have their particular *Chironomia*, or signs for the gestures with which the priest is to accompany the inflections of voice.

The beginning, or first note of every chant, is called *Ijon*, which is equivalent to the key or tone in which any melody is sung.

Kircher, to whom even Egyptian hieroglyphics are easy, has resolved the names of these Greek notes into Latin. *Musurgia, ubi supra.*

The abate Martini heard the Greeks, in Passion Week, sing several tropes or modes, which they now term *ᾠδαι*, in four parts, in the style of Palestrina: and this kind of music they call Cretan, but why, is not easy to divine, unless they learned counterpoint while the Venetians were masters of the island.

The abate says that he often heard the common people of Greece sing in concert, and observed that they made frequent use of the *fourth*: "della consonanza che noi chiamiamo oggi quarta." By this he must mean that they used it as a concord in two parts, or if there were more than two parts, in positions where our harmony forbids the use of it; otherwise it would not have affected his ear as a singularity.

The fact is curious, and we find it confirmed by Zarlino, who observed the same practice in the Greek church at Venice. The fourth, we find, was in such favour during the time of Guido, as to be preferred in disant to every other concord, and thought to constitute the most pleasing harmony. This partiality may probably have arisen from the importance of fourths in the ancient Greek system, and the want of a temperament to render thirds and sixths more agreeable; but the improvements in harmony soon brought it into disgrace in Italy, while, from a contrary cause, it has kept its ground to the present time in Greece, at least among the populace. And, indeed, even in Italy, it seems to have retained a part of its ancient privileges long after the time of Guido, and when harmony was thought to be in great perfection: for Zarlino says, that Jusquin, and the other old Flemish masters, used it frequently in their compositions: "nella parte grave, senza agguantarle altro intervallo."

The present state of Greek music, indeed, does not confirm or favour the opinion of Dr. Brown, who asserts with

his usual courage, that, "about four hundred years after Guido, the debauched art once more passed over into Italy from Greece: certain Greeks, who escaped from the taking of Constantinople, brought a refined and enervated species of music to Rome, &c." As many travellers assert that the modern Greeks have no music in parts, we may suppose, that in those places where it was heard by the abate Martini, it had been brought thither by the Venetians, during the time that they had possessions in the Archipelago.

That the Greek music has undergone many alterations since the ancient treatises that are come down to us were written, is certain from the change and increase of its vocabulary. Bryennius has given, as names of intervals, a list of barbarous terms not to be found in any preceding writer within our knowledge; and in the Greek glossary of Du Cange, and the abate Martini's papers, a great number occur that are not to be found either in writers of high antiquity, or in Bryennius.

The technical language of the Greeks has always been copious, and in music perhaps its seeming redundancy is more conspicuous than in any other art or science. But in other arts and sciences words are representatives of things existing; whereas, in denominating the tones and inflexions of voice, which, to realize, require new creation, there can be no correspondence between the type and substance. The colours, the forms, and objects, which a painter wishes to represent, are in nature; and the poet, in all the ebullition of wild enthusiasm and fervid imagination, describes what he has seen and felt, or what is to be seen and felt, and for which common language must supply him with symbols. But it has never entered the thoughts of man to give names to all the minute shades of colour between black and white, or to the gradations by which light is propagated between the time of total darkness and the sun's meridian. And yet, in a scale of sounds, from the lowest musical note in the human voice to the highest, where octaves are not represented by similar signs and appellatives, the names and characters must be numerous. The lines and clefs of the European music have certainly freed it from many perplexities with which it was embarrassed, even in the artless times of canto fermo.

But however flowery the Greeks may have made their ecclesiastical melody, or however they have multiplied its characters, the desire of permanence in the heads of the western church, with respect to all sacred matters, long kept music in the plain and simple state in which it was left by pope Gregory the Great; for we do not find, till the invention of counterpoint, that it received any material change or improvement. Our own bible and liturgy, if they remain in their present state five or six hundred years, will, perhaps, be unintelligible to the vulgar, though written in the best language of this country when they were introduced into the church. And the Greek and Roman languages, which were so well understood by the primitive Christians, became dead and obsolete by degrees, to all but the learned in after ages. The preclusion of change or innovation in sacred concerns which has occasioned permanence, has likewise been the cause of inelegance and obscurity.

Peter the Great, like his predecessors, had a particular partiality for the music of the church; maintained his own choir, or singers for divine service, and read publicly in the church the epistles and the hours, which, in that country, is permitted to be done by any layman, who delights in such exercise, as well as by the priests." (King's Rites of the Greek Church.)

Many of the kings of France not only sung in the choir, but composed hymns for it, and set them to music. (Laborde.)



(Laborde.) And we have heard his present majesty, at six o'clock prayers in St. George's chapel at Windsor, officiate alone as clerk; repeating the responses, and reading the psalms aloud verse for verse, with the minister, and uttering the amen in the clerical style.

Music has been very much cultivated at Petersburg in the Imperial chapel and metropolitan church during the last century, as well as in the theatre. And though no instruments are admitted in the Greek church, any more than in the Sistine or pontifical chapel at Rome, yet every vocal refinement, both in composition and performance, that can with propriety be allowed in ecclesiastical music, has been received in the church service at Petersburg, in the Imperial chapel and cathedral of which capital, near a hundred voices are daily employed; and at Moscow, in several churches, when the sovereign is there, forty or fifty.

The music of the Hymnologia of the Russian ambassador's chapel in London, is sung to figurative music in three and four parts, distinct from the intonations or canto fermo. It consists of short, elegant, and simple strains or movements, in the Italian style, in plain counterpoint, composed to Slavonian words, by Bortnianski, who was sent to Italy, early in life, by the empress Catherine, to study composition.

The taste for good music passed from the theatre to the church. The plain chant of the modern Greeks is different from that of other Christian churches. It is more varied than the Gregorian chant; and that of the hymns rather resembles the figurative music of motets, than canto fermo. The empress Elizabeth, who was well acquainted with the kind of counterpoint *à capella*, and had great pleasure in uniting her voice with the choir, would never allow the Italian *florid song* to have admission in the sacred service; but says the Gotha Almanac, in an abridged history of the music of Russia, 1772, "Italian music has invaded even the Greek church as well as the Roman." This voice of complaint borders on *crawling*. We have taken considerable pains to obtain information on the subject, and have heard the service of the Greek church performed in several parts of Europe; and we have been favoured with a score of some of the music in present use in that service, composed by Bortnianski, a native of Petersburg, and find that it is neither so bald and dry as canto fermo, nor so florid and flighty as that of the Italian theatre. It is plain counterpoint, *non fugato*, in which the words seem well accented, the parts moving all together; so that there is measure, clearness, tranquil and soothing air, pure harmony, and natural and simple modulation. Nothing vulgar occurs, nor any thing to remind us of the opera house, yet the strains are not without grace or gravity. It seems to excite attention by its sweetness and simplicity, more than by the art of fugue, or extraneous modulation.

*GREEK Music, Ancient.* We shall here introduce some observations on the subject, extracted from a dissertation written several years ago.

*Section I.—Of the Notation or Tallature of Ancient Music, including its Scales, Intervals, Systems, and Diagrams.*

The music of the ancients, according to Euclid, Alypius, and Martianus Capella, was divided into seven constituent parts: these were *sounds, intervals, systems, genera, modes, mutations, and melopœia*, or the composition of melody. To these divisions, which comprehended only what was denominated harmonics, or the science of music, strictly so called, were added five other requisites, no less essential for a musician to know, than the preceding seven; and these were, *rhythm*, or the regulation of cadences in all kinds of movement; *metre*, or the measure of verses; *organic*, or the instrumental art; *hypocritic*, or gesture; and *poetic*, or

the composition of verses. And still to these divines, Aristides Quintilianus, and some other musical writers, add *œdium*, or the art of singing; which, indeed, seems of more importance to music, than either the *organ*, or *hypocritic*. In order to communicate to our readers all the information we are able, upon so dark and difficult a subject, we shall consider the music of the ancient Greek under such heads only as absolutely concern music, according to our application of the word; for it is plain that several of its constituent divisions more immediately belonged to poetry. Besides these two arts were at first so intimately connected, and so dependent on each other, that rules for poetry were general rules for music, and the properties and effects of each were so much confounded together, that it is extremely difficult to disentangle them.

Leaving, therefore, for the present, all other divisions, divisions, and sub-divisions, with which ancient music is strewed about, we shall proceed to fulfil the title of this section.

In the study of modern music, the first object of enquiry are the names by which the several sounds in the scale are expressed; and, if we regard music as a language, the letters or gammat may be called its alphabet.

Plutarch says, that it is not sufficient for a musician to know what kind of music should be set to any particular poem; he should likewise know how to write in each of the genera, that is to say, in the *diatonic* or natural scale, consisting of tones and semitones, as at present; in the *chromatic*, in which the scale was divided into quarters and minor thirds; and in the *enharmonic* genus consisting of quarter tones, and major thirds, as will be explained hereafter.

It does not appear from history, that the Egyptian, Phœnician, Hebrews, or any ancient people who cultivated the arts, except the Greeks and Romans, had musical characters; and these had no other symbols of sound than the letters of their alphabet, which likewise served them for arithmetical numbers and chronological dates.

As the notation of the Greeks was imagined in the infancy of the art of music, when the flute had but few holes, and the lyre but few strings, the simplicity of expressing the octave of any sound by the same sign, as in modern music, was not thought of; the most ancient and constant boundary of musical tones having been the *diatonic*, or *fourth*, the extremes of which interval were fixed, though the intermediate sounds were mutable; and in the manner of tuning these consisted the difference of intervals in the several genera.

The Greek scale, in the time of Aristoxenus, the oldest writer upon music, whose works are come down to us, extended to two octaves, and was called *γλυκύτης μέγιστος καὶ ἀμετάβλητος*; the great, the perfect, the immutable system; because its extremities formed a perfect octave, including all the simple, double, direct, and inverted concord, with all the particular systems; and it was the opinion of the ancients that this diatessaron, or double octave, was the greatest interval which could be received in a chord.

This whole system was composed of five *tetrachords*, or different series of four sounds, and one note added at the bottom of the scale to complete the double octave; where the first which produced this fourth was called *πρῶτον*, or *proton*, *λambanomenon*, or note supposed to the scale; for though this was constantly the lowest sound in all the modes, it was not included in the tetrachords.

All these sounds had different denominations in the system, like our gammat. *A*, *B*, *C*, *D*, *E*, &c. Besides two different characters, one vocal, and the other instrumental, appropriated to each sound in the several modes and genera, for the purpose of writing down melodies.

That the fourth was a favourite and important interval

the music of the ancients, is plain from the great system of two octaves having been composed of five of these tetrachords, in the same manner as the scale of Guido is of different hexachords.

The first tetrachord is called by the Greek musicians *hypaton*, or principal; the sounds of which are denominated:

1. *Hypate hypaton*, principal of principals;
2. *Parypate hypaton*, next the principal;
3. *Lichanos hypaton*, or index of principals; from its having been played with the index or fore-finger. This third sound of the first tetrachord in the diatonic genus was likewise called *hypaton diatonos*.

4. *Hypate meson*, or principal of the middle or mean tetrachord; for this sound not only served as the last or highest note of the first tetrachord, but as the first or lowest of the second; whence these two tetrachords were called conjoint, or connected. These four denominations of the sounds in the first tetrachord may be compared with the terms *B mi*, *C fa ut*, *D sol re*, and *E la mi*, in the Guido scale; or with the sounds



The sounds of the *meson*, or middle tetrachord, were placed in the following order:

- Hypate meson*, or principal of the mean tetrachord;
- Parypate meson*, next to the middle principal;
- Lichanos meson*;

*Mese*, or middle, as this sound completes the second tetrachord, and is the centre of the whole system. The sounds of this tetrachord correspond with those which in the base of the scale of Guido are called *E la mi*, *F fa ut*, *G sol re ut*, and *A la mi re*, which are equivalent to



Durum Hexachord.                  Natural Hexachord.                  Molle Hexachord.

Ut re mi fa sol la.    Ut re mi fa sol la.    Ut re mi fa sol la.

It appears from the Greek tetrachords, as well as from this example, that neither the ancients nor the early moderns admitted the *sharp seventh* of a key into their scales.

The fourth tetrachord, ascending, is called *diezeugmenon*, disjunct, or separated, as it begins at *B natural*, which is not a note in common with any one in the other tetrachords. But though this system of four sounds is only an octave higher than that of the first tetrachord, and though the next is but a replicate of the second, we shall present them to the reader, as the several sounds of which they are composed have in the Greek music different denominations.

The first sound of the second octave, or series of eight sounds in the ancient great system, is *mese*, and the first of the fourth tetrachord begins with the note

*Paramese*, near the *mese*, or middle sound; the next is called

*Trite diezeugmenon*, or third string of this tetrachord from the top: then follows the *paranete diezeugmenon*; and lastly, the

*Nete diezeugmenon*, or final sound of this tetrachord;

The *mese* in ancient music was of equal importance with the key note in modern music: being an octave above the *proslambanomenos*, which was the lowest sound of the ancient modes, and a kind of key note to them all.

Euclid calls *mese* the sound by which all other sounds are regulated. And Aristotle, in his XXXVth Problem, sect. 19. says that all the tones of a scale are accommodated, or tuned, to the *mese*. The same author likewise tells us, Problem XX. that all melody, whether it moves above or below the *mese*, has a natural tendency to that sound.

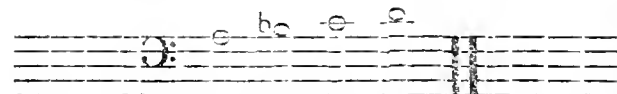
The third tetrachord, beginning by the last note of the second, was thence called *synemmenon*, the united, or conjoint tetrachord; the sounds of which proceed in the following order:

*Mese*;

*Trite synemmenon*, or third string of this tetrachord from the top;

*Paranete synemmenon*, penultima of this tetrachord;

*Nete synemmenon*, last of the *synemmenon* tetrachord; the four sounds of which correspond with those in the centre of our gammut, that are called *A la mi re*, *B fa*, *C sol fa ut*, and *D la sol re*, or



After ascending regularly thus far, up to *D*, by three conjoint tetrachords, the fourth tetrachord in the great system is begun by descending a minor third to *B natural*, the octave above the first sound of the lowest tetrachord. Something of this *dodging* kind is to be found in the scale of Guido, divided into hexachords: for, after ascending six notes regularly in the *durum hexachord*, it is necessary to descend a major third, if we would begin the *natural hexachord*; and when the natural hexachord is completed, if we would begin at the *molle*, it can only be done by a leap of a third below. This will best appear by an example in notes:

which includes the sounds *B mi*, *C sol fa ut*, *D la sol re*, and *E la mi*, in the middle of the Guido scale, or



The last sound of the fourth tetrachord is the first of the fifth, which is called the *hyperbolæon*, or supreme tetrachord; the sounds of which ascend in the following order:

*Nete diezeugmenon*, last of the *diezeugmenon* tetrachord;

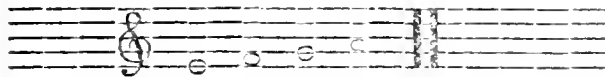
*Trite hyperbolæon*, third string of the *hyperbolæon* tetrachord;

*Paranete hyperbolæon*, penultima of the supreme tetrachord;

*Nete hyperbolæon*, last of the supreme, or highest tetrachord, and of the great system, or diagram.

This last tetrachord, being added to the scale long after its formation, was called *hyperbolæon*, from its sounds being more acute than the rest, and beyond the common bounds

bounds of the scale; in the same manner, as, with us, the notes above D in the treble are said to be *in alt.* This tetrachord includes the sounds E *la mi*, F *fa ut*, G *sol re ut*, and A *la mi re*, or

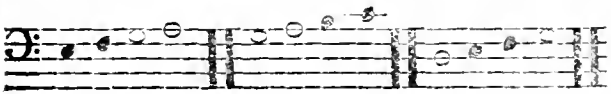


The ancients used likewise four different monosyllables ending with different vowels, by way of *signification*, for the exercise of the voice in singing; like our *mi, fa, sol, la*. These were, for the first note of each tetrachord,  $\tau\alpha$ , for the second  $\tau\beta$ , for the third  $\tau\gamma$ , and for the fourth, if it did not serve as the first of the adjoining and relative tetrachord,  $\tau\delta$ ; but if it began a new tetrachord, it was called by the first name,  $\tau\alpha$ .

The repetition of these monosyllables is a further proof that the fourth in the ancient music served as a boundary to a system of four sounds, in the same manner as a hexachord did in the Guido scale, and as an octave does for eight sounds in the more modern practice.

Any interval between the terms of which one or more sounds intervened, was by the ancients called a *system*: EG, for example, constituted a system of a third minor; EA, of a fourth; EB, of a fifth. &c.

These smaller systems were of different species; thus there were three kinds of tetrachords, that differed in melody by the position of the semitone, which was sometimes at the beginning, sometimes at the end, and sometimes in the middle; as in the following example, where the black notes are semitones, and the white, tones.



As the Greeks used all the four and twenty letters of their alphabet for musical characters, or symbols of sound; and as their most extensive system or scale did not exceed two octaves, or fifteen sounds, it should seem as if their simple alphabet was more than sufficient to express them; for their music being at first only a notation of their poetry, the rhythm, or air, must have been determined by the metre of the verse, without the assistance of signs of proportion peculiar to music. But supposing it was necessary for them to have different characters to express the different feet of the verse; and instrumental being chiefly vocal music played by instruments, had likewise no need of them, when the words were written, or the player knew them by heart.

However, in order to multiply these characters, the letters of their alphabet were sometimes written in capitals, and sometimes small; some were entire, some mutilated, some doubled, and some lengthened; and besides these distinctions in the form of the letters, they had others of situation, sometimes turning them to the right, sometimes to the left; sometimes inverting, and sometimes placing them horizontally; for instance, the letter *gamma*, by these expedients, served to express seven different sounds: **Γ Γ Γ Γ Γ Γ Γ**. Some of the letters were also barred, or accented, in order to change their symbolical import; and these still not sufficing, they made the common grave and acute accents serve as specific musical notes.

It is a matter that has been long disputed among the learned, whether accents were originally musical characters,

or marks of *profody*. It is in vain to set about determining a question concerning which the proofs on both sides are so numerous. (See Gally and Spelman *against accents*, and Primatt and Forster in defence of them.) Mr. W. it is firmly of opinion "that accents were originally *musical notes*, set over words to direct the several tones and inflexions of the voice, requisite to give the whole sentence its proper harmony and cadence" (Pind. vol. ii.) And the Abb. du Bos, who frequently by a peremptory decision cuts the knot of such difficulties as he is unable to untie, and is, without sufficient proof, that as poets originally set their own verse, they placed for this purpose a figure, or accent, over each syllable. So that, according to this writer, we are at present not only in possession of the *poetry* of Homer, Pindar, Anacreon, and Sappho, but their *music*. Why then do we complain of the total loss of Greek music? (See Reflex Critique, c. iii. p. 85.) But as music had characters different from accents so early a time, the time of Terpander, to whom the invention is given by the Oxford Marbles, which place this event about six hundred and seventy years before Christ; and as accents for profody are likewise proved to be of high antiquity, it seems as if there could have been no necessity for the ancients to use one for the other.

But it has already been remarked that the letters of the alphabet, though turned, distorted, and mutilated, in many different ways, were insufficient to express the sounds of all the modes in the three genera; so that recourse was had to accents, as the scale became more extended, in order to augment the number of characters. And Alypius, in the enumeration of the notes in the euharmonic genus, tells us, that *trite synemmenon* is represented by *lambda* and the *acute accent*; and *parante synemmenon enarmonia* by *alpha*, and the *grave accent*.

This is a proof that the accents were known at the time of Alypius, and were then used chiefly for profody, not music, for which they were only called in occasionally. Indeed they are mentioned as accentual marks by writers of much higher antiquity than Alypius; for not only Cicero and Plutarch, but Aristotle and Plato, speak of them as merely regarding the elevation and depression of the voice in speech. However, in the early Greek and Roman MSS., as will be shown hereafter, the musical characters used in *canto fermo*, seem to have been only *lengthened accents*.

These various modifications of letters and accents in the Greek notation composed in all one hundred and twenty different characters, which were still considerably multiplied in practice; for each of these characters serving many purposes in the vocal as well as instrumental tablature or gamut, and being changed and varied according to the different modes and genera, as the notes of our notes are changed by different cleffs and keys, the one hundred and twenty Greek characters produced one thousand six hundred and twenty notes!

Two rows of these characters were usually placed over the words of a lyric poem; the upper row serving for the voice, and the lower for instruments.

If we had not the testimony of all the Greek writers who have mentioned these characters, for their use and destination, it would be natural to suppose that the double row of different letters placed over each other, and above the words of a poem, were intended to express *different parts*, with respect to *harmony*; as with us, in modern music, the treble notes are written over the bass, and the first treble over the second; but Alypius, who is extremely minute in his instructions concerning the use of these characters, in all these modes, tells us, in express terms, that the upper line of the notes is for the words, and the lower for the lyre. (Στμ ιβ ττ)

μεν αυου, της λεξεως τα δε κατω της κρησιως. Introd. Mus. edit. Meibom. p. 2.) We are told, not only by Alypius, but by Gaudentius, p. 23, that of the two rows of letters used for musical characters, the upper is for the words, that is, *to be sung*, and the under *to be played*. And he afterwards proves them to have been unisons to each other, both by his definitions and by placing them opposite to the same found in all the scales.

In this author, the notes of the great system of the Lydian mode in the diatonic genus are arranged in the following order:

Z. Γ Ρ Φ C P M I Θ Γ Ω Z E Ω ϕ Δ M' I  
 Γ Γ L F C O I < V N Z Γ Δ Z η ε. ι' <'

And these he defines in such a manner as leaves no room to doubt of the identity of their signification.

It is somewhat strange that the notes for the voice in ancient music should be placed *above* those for the lyre, and consequently further from the words. Meibonius, in his preface, has, however, given a curious reason for this custom, from a fragment of Baccilius, senior: "The upper line of notes is for the poem, the lower for the lyre; because the mouth, which alone gives utterance to the words, is placed by nature above the hands, which produce tones from the instrument.

Z Γ *Proflambanomenos*, an imperfect Zeta, and Tau placed horizontally.

Γ Γ *Hypate hypaton*, an averted Gamma, and a Gamma direct.

R L *Parypate hypaton*, an imperfect Beta, and a Gamma inverted.

Φ F *Hypaton diatonos*, a Phi, and a Digamma.

C C *Hypate meson*, Sigma and Sigma.

P O *Parypate meson*, Rho, and Sigma inverted.

M I *Meson diatonos*, Mu, and a lengthened Pi.

I < *Meze*, Iota, and a horizontal Lambda.

Θ V *Trite synemmenon*, Theta, and an inverted Lambda.

Γ N *Synemmenon diatonos*, Gamma and Nu.

Ω Z *Nete synemmenon*, an inverted Omega and a Zeta.

Z Γ *Paramese*, Zeta, and Pi placed horizontally.

E Δ *Trite diezeugmenon*, Epsilon, and an inverted Pi.

Ω Z *Diezeugmenon diatonos*, as *Nete synemmenon*, which was the same string in the lyre.

ϕ η *Nete diezeugmenon*, horizontal Phi, and a small Eta lengthened.

Δ ι *Trite hyperboleon*, an inverted Upsilon, and an imperfect Alpha.

M' ι' *Hyperboleon diatonos*, Mu, and a lengthened Pi, accented.

I < *Nete hyperboleon*, Iota, and an accented Lambda, placed horizontally.

It is from the indefatigable labour of the learned Meibonius, in his Commentaries upon the ancient Greek musicians, particularly Alypius, that we are able to decypher these characters; which, before his time, had been so altered, corrupted, disfigured, and confounded, by the ignorance or negligence of the transcribers of ancient manuscripts, that they were rendered wholly unintelligible.

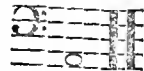
With our utmost study, reading, and contemplation, we could reduce the Greek notation to no order, nor ascertain whether it was to be read upwards or downwards. The neglect of these distinctions will introduce an universal scepticism concerning every part of ancient music.

Gallei, Zarlino, Bontempi, Tevo, M. Rousseau, Dr. Brown, and others have asserted, that the terms *high* and *low* had different acceptations among the ancients, from those in which they are understood by the moderns, without guard-

ing, as they ought to have done, against such consequences, with respect to the situation of the scale, as it was natural for the reader to draw from that assertion.

At length, an infallible rule presented itself to us in the works of the great Euclid, who has been regarded for so many ages as the legislator of mathematicians, and whose writings have been their code. In his section of the Canon, p. 37, edit Meibom. he represents *proflambanomenos* by the *whole string*: so that, if any thing concerning ancient music can be made certain, it is, that this whole string represented the *lowest found* in the Greek scale, which, in the Hyper-

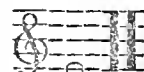
borian mode, was equivalent to the note A



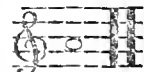
Half the string, *Meze*, its octave, a,



Third part, *Nete diezeugmenon*, fifth of the octave, e,



And the fourth part of the string, *Nete hyperboleon*, the double octave, aa,



which include all the concords that the ancients admitted. Eight ninths of the string are allotted to the found *Hypate parva gravis*, which is B in the base, one tone higher than *proflambanomenos*, or A.

This representation of the whole string and its divisions into harmonic and aliquot parts, must put an end to every doubt concerning the order of the scale, which may have arisen from the inverted application of the words *high* and *low*, constantly occurring in all the more ancient and authentic Greek writers on music.

Sec. II.—Of the three genera, *Diatonic*, *Chromatic*, and *Enharmonic*. See GENERA, DIATONIC, CHROMATIC, and ENHARMONIC respectively.

Sec. III.—Of *Modes*. See MODES.

Sec. IV.—Of *Mutations*. See MUTATIONS.

Sec. V.—Of *Melodia*. See MELODIA.

Sec. VI.—Of *Rhythm*. See RHYTHM.

Sec. VII.—Of the *Practice of Melopoeia*. See MELODIA.

Sec. VIII.—Whether the Ancients had counterpoint or music in parts.

This is a subject which has given birth to many learned disquisitions and disputes; and as it long remained a mere matter of opinion, those who believed, and those who denied the point in question, consequently treated each other with all due polemic acrimony. The champions for antiquity thought themselves involved in the controversy; and whether they were possessed of musical knowledge, or were sensible to the charms of harmony, or not, they determined to regard every man as an enemy to sound literature, who did not subscribe to the articles of their faith.

A poem, called "Le Siècle de Louis le Grand," written by Charles Perrault, of the Academy of Sciences, and brother to Claude Perrault, the famous physician and architect, occasioned the long and acrimonious dispute between him and Boileau, and soon brought on a general war among the learned throughout Europe, concerning the superiority of the ancients or moderns, with respect to arts, sciences, and literature. This piece was first read by the author at the Academy of Sciences in 1687, and was soon followed by his "Parallele des Anciens et des Modernes." The notes to Boileau's translation of Longinus were intended as a reply to Perrault, and are full of bitter invectives, not only

only against him, but the moderns in general. Rucio, La Bruyere, and Fontenelle, took sides in the quarrel, which in France was kept alive, with great animosity, for near thirty years.

In England, the controversy between sir William Temple and Mr. Wootton, Mr. Boyle and Dr. Bentley, and Swift's "Battle of the Books," were consequences of this quarrel.

Those who had written *ex professo* on music, had frequently differed in their opinions concerning counterpoint having been known by the ancients, previous to the learned, in general, interresting themselves in the dispute; and before we give our own opinion, as an individual, it is incumbent on us, as an historian, to inform our readers, who were the principal champions on both sides. Would it not render our article too long, the reasons assigned by each for seizing his sword, that is, his pen, in the quarrel, should likewise have a place here. But our limits will only allow us to say, that the most eminent defenders of ancient harmony in our knowledge of the word, are Gaffurio Zarlino, Gio. Battista Doni, Isaac Vossius, Zacharia Tevo, the abbé Fraguier, and Mr. Stillingfleet, author of "Principles and Power of Harmony."

Their oponents are Glarianus, Salians, the cavalier Hercules Bottrigari of Bologna, Artuti, Cerone, Kepler, Mercennus, Marilius Ficinus, Kircher, Claude Perrault, and the late elegant and learned poet Mr. Mason, who had studied modern music, and has left his decided opinion against the ancient Greeks having cultivated counterpoint. (Hist. Mus. vol. i. p. 125.) To these we may add Bontempi, the first Italian musical historian, the learned Dr. Wallis, M. Barette, who has explored the subject, and considered it in all its ramifications. Padri Martini of Bologna, a learned and diligent inquirer, has given a specimen (Stor della Mus. t. i. p. 174.) of such meagre counterpoint as was likely to have been produced without the use of imperfect concords, which the Greeks termed discords. The late throwd and penetrating critic J. J. Rousseau is very explicit upon this subject in his "Musical Dictionary," at the article *Counterpoint*, which he terminates by saying, "It has long been disputed whether the ancients knew counterpoint; but it clearly appears from the remains of their music and writings, especially the rules of practice, in the third book of Aristoxenus, that they never had the least idea of it."

After this list of the most respectable writers on both sides of this long disputed question, it now remains to tell the reader ingenuously our own sentiments: and to confess the truth, we will venture to say, that we do not believe the ancients ever did use *simultaneous harmony*, that is, *music in different parts*; for without thirds and sixths it must have been insipid; and with them, the combination of many sounds and melodies moving by different intervals, and in different times, would have occasioned a confusion, which the respect that the Greeks had for their language and poetry would not suffer them to tolerate.

*Sect. IX.—Of the Dramatic Music of the Ancients.* See *DRAMATIC Music.*

The Greek dramas consisted of soliloquy, dialogue, and chorus, and it has naturally been supposed, that these were sung to different kinds of music. Soliloquies full of sentiment and passion had probably a different, more elaborate, and refined melody, than the dialogues; but the chorus must necessarily be set to measured music, or the performers, if left *ad libitum*, could never have kept together.

*Sect. X.—Of the effects attributed to the music of the ancients.*

Materials for this part of our dissertation are so numerous, that if we were only to present the reader with all the stories

that have been related by the most grave and respectable historians and philosophers of Greece and Rome, concerning the moral, medicinal, and supernatural powers of music, this section would be as full of the miracles of magicians, as the "Golden Legend" is of those operated by the faunts. The credulous and exclusive admirers of antiquity have, however, so long read and received, that the prevalent idea of the excellence of ancient music, which they are very unwilling to relinquish; and yet, after a most careful investigation of the subject, and a minute analysis of this music, by examining its constituent parts, we have not been able to discover that it was superior to the modern in any other respects than its simplicity, and its adherence to metrical feet, when applied to poetry. For, as *music*, considered abstractedly, it appears to have been a great inferior to the modern, in the two great and essential parts of the art, *melody* and *harmony*.

We have considered the marvellous effects ascribed to ancient music, under three several heads:

First, in softening the manners, promoting civilization, and humanizing men, naturally savage and barbarous;

Secondly, its effects in exciting, or repressing the passions;

And thirdly, its medicinal power, in curing diseases.

And we think, that the whole may be converted into poetical fables, allegories, and vulgar errors. Many strange stories of the power of music over man and beast have gained admission into books, even in this philosophical and unbelieving age, at which posterity will doubtless stare!

*GREEK Cross.* See *CROSS.*

*GREEK Empire.* See *EMPIRE.*

*GREEK Grammar.* See *GRAMMAR.*

*GREEK Language*, the language of the Greeks. Whether we consider the high antiquity of this tongue, its varied excellencies, the unrivalled models of composition which it contains, or the extensive influence which the study of it has produced on the more modern dialects of Europe, it claims, in an eminent degree, the attention of learned men, as a subject no less curious than useful. The advantages to be derived from the study of those authors who have written in this tongue, are too notorious to need description, and are recommended to us by the united testimony of the learned in every age and country. The Greeks have left the most durable monuments of human wisdom, fortitude, magnificence, and ingenuity, in their improvement of every art and science, and in the facile writings upon every subject necessary, profitable, elegant, or entertaining. They have furnished the brightest examples of every virtue and accomplishment, natural or acquired, political, moral, or military; they excelled in mathematics and philosophy; in all the forms of governments, in architecture, navigation, commerce, war; as orators, poets, and historians, they stand as yet unrivalled, and are likely to continue unrivalled for ever; nor are they less to be admired for the exercises and amusements they invented and brought to perfection, in the institution of their public games. Nor can we become weary of these admired excellencies in any of the best translations from the Greek. They may indeed communicate some knowledge of what the originals contain: they may present us with propositions, characters, and events; but allowing them to be more faithful, more accurate than they really are, or can well be, still they are no better than copies in which the spirit and lustre of the originals are in a great degree necessarily lost. The powers of the Greek are vastly beyond those of any other tongue. Whatever the Greeks writers describe is always felt, and almost seen; motion and

music are in every tone, and enthusiasm and enchantment possess the mind when we peruse them with taste and judgment.

The Greek tongue, as it was spoken in different provinces, was divided into different *dialects*, called the *Attic*, the *Ionic*, the *Doric*, and the *Æolic*. The Attic is that which was used at Athens, and in the adjacent country; those who have particularly distinguished themselves in this dialect, are Thucydides, Aristophanes, Plato, Iocrates, Xenophon, and Demosthenes. The Ionic differed very little from the ancient Attic; but having afterwards made its way into some towns of Asia Minor, and into the adjacent islands which were colonies of the Athenians and Achæians, (among which are reckoned Samos, Miletus, Ephesus, Smyrna, and some others,) it imbibed a new tincture, and fell very far short of that delicacy to which the Athenians afterwards attained. The principal writers in this dialect were Hippocrates and Herodotus. The Doric first prevailed among the Lacedæmonians and the inhabitants of Argos. It travelled afterwards into Epirus, Sicily, Rhodes, and Crete. This dialect has been used by Archimedes and Theocritus, (both of Syracuse,) and Pindar. The Æolic was spoken at first among the Bœotians and their neighbours, and afterwards it passed into Æolia, a province of Asia Minor, between Ionia and Mysia, which included ten cities, all Greek colonies. The chief writers in this dialect were Sappho and Alceus, of whose writings little has survived the loss of ancient learning; but this idiom is occasionally blended with the use of the other dialects in the compositions of Homer, Theocritus, Pindar, and others. It may be remarked farther that the lapse of time which occasioned the difference of these dialects, as they arose from a common stem, has moreover caused them to differ from themselves. For instance, in the Attic there is a wide distinction between the style of Demosthenes, and that of Thucydides. Nor has the Ionic dialect invariably continued the same, the people of Asia speaking it differently from the old Ionians of Greece, who followed the ancient language of Athens, and the same observation holds in regard to the Dorians and Æolians.

The ramification of the Greek tongue into its several dialects, while it forms one leading cause of its copiousness, occasions one of the most serious difficulties in the acquisition of it by learners. This difficulty, however, will be much diminished, if the dialects be reduced to those unavoidable changes, which are founded in the nature of language, and in the organs of speech. The changes we mean are such as flow from the fluctuation of the vowel sounds, from the different manner of combining, or of resolving any two concurrent vowels, and lastly, from the substitution or interchange of the homogeneous consonants, *i. e.* the consonants of the same organs.

Oriental grammarians, with much propriety, have divided the consonants into three classes, corresponding with the organs employed in founding them. Thus π, β, ς, being founded by the lips, are hence called *labials*. On the other hand, τ, θ, δ, γ, ζ, σ, ε, enunciated by a contact of the tongue with the extremities of the upper teeth, are, for a similar reason, styled *dentals*; while ρ, κ, χ, uttered by a contraction of the *larynx*, receive the name of *gutturals*. This distribution of the consonants, though here confined to the Greek alphabet, necessarily extends to any other system of letters, and well deserves the attention of him who would acquire a philosophical acquaintance with the origin and derivation of words. To the interchange of the homogeneous consonants, it is chiefly owing that the primæval language of men, at first rude and barren, became copious and

refined (the same original term hence splitting into many), was afterwards diversified into distinct dialects, and at length lost in distinct languages. Nor is it, we conceive, beyond the reach of philological enquiries to prove that the simple terms of any one language have their kindred terms in all other languages, disguised indeed by the differences of character, termination, and meaning; and that they may be traced back through the several stages of social life, till they meet, like so many shoots, in one common root.

The Greek language is a very copious subject, and a full account of it would carry us beyond the limits necessarily prescribed by our plan; we shall therefore content ourselves with some remarks calculated to ascertain its origin, and to unfold those analogies by which it grew from a few simple roots to the copiousness and refinement which distinguish it beyond most other tongues.

In enquiring into the origin of the Greek tongue, or in referring it to a higher dialect, we of course mean its roots or primæval words, which were few in number, and consisting of two, three, or at most four letters; while its compound terms, which are exceedingly numerous and diversified, must have been indigenuous, the products of time, and of improvement in knowledge and the arts of life, long after the introduction of its more elementary parts into Greece. With this limitation we have no hesitation in saying, that the simple words of the Greek language are all derived from the Hebrew, Arabic, and Persian, and principally from the first of these tongues. And for the affirmation that the Greek is derived from the Hebrew, or that the Greek primitives are Hebrew radicals, we offer the following observations. Moses, in the tenth chapter of Genesis, the fountain head of universal history and geography, enumerates those heads of separate families by whom the earth was divided after the flood. He describes them by those names which the nations that sprung from them, or the countries they severally occupied, retained in his time. By those parts of the earth, which he calls עֲשָׂרֵי הַיָּם, or *the isles of the nations*, it is understood that he means *Europe*, and its adjacent islands. These were divided by the sons and grandsons of *Japheth*, or rather by *Gomer* and *Javan*, and their sons,—“In their lands every one after his tongue, after their families in their nations.” This division must have been regularly conducted. It must have taken place in the time of the patriarchs here mentioned; for the act was *theirs*, and the nations retained their names to the time of Moses; nay many of them long afterwards, for we find them recognized by history and geography. *Javan* is well known as the parent of the *Greeks*, the name *Ionians* being anciently applied from him to the several branches of that nation. τῶν Ἑλλήνων, καὶ Ἀχαιῶν, καὶ Βοιωτῶν Ἰωνῶν ἑκατόν. *Hesychius*. Πρωτοῖς Ἑλλήνων Ἰωνῶν ἢ Βασιλῶν ἑκατόν. But it appears from the sacred history that Javan spoke the Hebrew tongue; and he, with the colony under him, must have introduced it with them, and made it the first language of Greece. The letters of the Greek tongue refer its origin to the same oriental source; for they are nearly the same with the *Samaritan* when inverted, or written after the European manner, from left to right; and with little variation they have ever retained the names of the Samaritan or Hebrew alphabet. This is confirmed by Diodorus the Sicilian, lib. v. who gives it as the opinion of persons in his days, that letters were invented by the *Syrians*, from whom the Phœnicians first learnt their use, and then communicated them to the Greeks. These Assyrians, Herodotus describes (l. iii.) as the inhabitants of Jerusalem, to which he gives the name of *Cadytus*, the name it had of old, and still continues to have in the East. The authority of Herodotus and Diodorus, Pliny, it





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These examples are sufficient to shew how the Greek has been derived from Hebrew roots. Some thousands of Greek primitives owe their origin to the same source; and it is not too much to say that, if the Hebrew language had been preserved in the full extent in which it once flourished, not a Greek term could be named, which might not be traced to some one of its roots. But as its records are comparatively so scanty, many of the parent terms of Greece may more immediately be found in the kindred tongues of Syria, Chaldaea, Arabia, and even Persia, which last, though different in its letters from the Greek, contains a multitude of its radical terms. The conclusion that Greek originally flowed from the Hebrew tongue, serves to explain many of the properties which distinguish this celebrated language, and to correct many errors into which learned men have fallen in treating this subject.

"The eastern tongues, says Dr. Gillies, (History of Greece, vol. i. p. 15.) are in general extremely deficient in vowels. To be, or rather was, much disputed, whether the ancient orientals used any characters to express them. Their languages, therefore, must have had an inflexible thickness of sound, or namely different from the vocal harmony of the Greek, which abounds not only in vowels, but in diphthongs. This circumstance denotes, in the Greeks, organs of perception more acute, elegant, and discerning. They felt such slight variations of liquid sounds as escaped the dulness of Asiatic ears, and invented marks to express them. They distinguished in this manner, not only their articulation, but their quantity, and afterwards their musical intonation. We do not think this observation altogether just, but think it rather founded in a misconception of the oriental languages. In these every consonant included in itself the vowel necessary to its enunciation; and while they thus presented a series of consonants to the eye, each in pronunciation is accompanied with its appropriate vocal sound, which rendered every word just as many syllables as it had of consonants, and gave to the language an exact mixture of vowels and consonants. When the Hebrew tongue ceased to be a living language, its true pronunciation was of course lost; and with it was lost the found and even the existence of the included vowel; and to supply this loss were invented the vowel points in Hebrew, Arabic, and the accents in Greek, which appear to be of kindred or rather of the same invention with the diacritical marks in the Asiatic tongues. The early Greeks, being sensible of the included vowel in the parent tongue, gave it a separate existence, by annexing it to the consonant; and as this vowel, though originally the same and always short, was liable to fluctuation, and to perceptible difference of sound, it naturally gave birth to the several short vowels. In Homer the digamma, which was a labial consonant, interposed between two vowels, which otherwise would have formed a diphthong. And this circumstance might lead us to conclude that the early Greeks conformed to the Asiatic tongues in rejecting the use of diphthongs, and that the use of diphthongs prevailed only as the digamma was laid aside. In the more ancient languages of Asia, all the included vowels were short, and every vowel that had an independent form was probably long; but short as well as long vowels came in time to have a separate existence; and the Shanferit, so far from being deficient in vowels, can boast of *sixteen*, a number more than the double of those in Greek.

We remark, in the second place, that the derivation of the Greek primitives from the oriental tongues will, in general, set aside as nugatory and erroneous the derivations of the ancient *scholiasts*, and of those modern lexi-

cographers who have adopted their explanations. These scholiasts and grammarians are valuable as expounders of the Greek text; but as they were apparently ignorant of the oriental tongues, the account which they give of the words thence derived are often frivolous in the extreme. It is necessary to justify this assertion by a few examples. *Αμυσία*, a hedge or fence, occurs in Theocritus, Idyl. i. 47, and the scholiast derives it from *αἷμα*, blood; because those who pass through such a fence are made to bleed. This derivation, nugatory as it appears, is adopted by Hederic in his lexicon: whereas its origin is the Hebrew *אָמַץ*, *amez*, to strengthen, to secure, and thence applied to a hedge, which by surrounding defends a place. On the same principle *κῆπος*, a garden, the origin of which neither Hederic nor any of the ancient scholiasts, we believe, have attempted to unfold, is borrowed from *קָפַף*, *kaph*, to surround: hence the term denoted a place surrounded or secured as a garden is. Lennep indeed derives it from *κῆπος*, *breath*, a word quite foreign to the purpose. The word *βουζα*, which occurs in Theocritus Idyl. vii. 10, is thus explained by the scholiast; *πηγαία Κῆ, ἄπο του βου μοῦρου, ἀπὸ του βου η ὄτι θοοὺ ἴσιν παρὰ πύλωνος*, i. e. a fountain in Cos, from the particle *βου* (large), and *βου*, to flow, or because it resembles the nostrils of an ox; whereas *βουζα* is evidently the Hebrew *בַּרְזַב*, *baar*, or *בַּרְבַּ*, *bar*, a fountain. The Greek scholia, annexed to every author, abound with such puerilities as the above; nor is the "Etymologicum Magnum" to be excepted, though the Greek lexicographers have fought for no better or more rational guides in their enquiries after the origin of the words which they explain.

Hemsteruse, Valckenaer, Ruhnken, Villoison, Lennep, Scheid, are indeed justly celebrated among modern critics for their researches into the origin and meaning of the Greek tongue. Their theories contain many valuable observations on the analogy by which that language grew from comparatively few radicals to its present complicated form; but their system of etymologies appear to us, for the most part, fanciful and erroneous; because in no instance, or at least in very few instances, have they sought the Greek terms in the languages of the East, whence assuredly they had been derived. Hemsteruse derives *θεός*, *Deus*, from the verb *θεῖν*, to run, to dispose; while its real origin, in our opinion, is the Hebrew and Arabic *הָאָה*, *zæe*, pronounced in the latter language *dhao*, to shine. The Chaldeans represented the Supreme Good under the figure of light; and to this representation the sacred writer seems to allude, when he says that God is light. The same writer deduces *στῆναι*, *strong*, from *βεβύς*; while its source is *בָּבַר*, *abur*, to be strong. From the same origin he supposes *πῆν* or *πεῖν*, *before*, to have flowed, though it seems to point to the Hebrew *פְּרָע*, *phra*, which in Arabic means the head or root of a family, and hence it came to signify origin or priority in the form of *πεῖν*; hence *prior* or *prius* in Latin.

Scheid derives *τερας*, an omen, from *τερεν*, *tero*, to wear, because omens, says he, obterant, quasi sine stupore percipient, enecent que mortales. But the word is the Hebrew *תֵּרַס*, *teer*, a bird, divination, which was taken from birds. The same writer will have *κατὰ*, or *καθὰ*, *to eat*, to have come from *κατὰ*, or *κατὰ*, to stretch, though far more naturally it points to the Persian *دند*, *dend*, dens, a tooth; and hence *κατὰ* primarily meant, to cut with the teeth. The Hebrew *זָרַע*, *zer*, to shine, to scorch, gave birth to *ξηρα*, aridus; but Villoison foolishly derives it from *ξίω*, *radere*. The same critic as wisely traces *ξίλον* to the same root, because, says he, lignum sit ad radendum aptum. But its origin is evidently *גִּזְזָן*, a grove, hence *αἶψλο*, wood, and by dropping the first vowel *ξίω*, and by transposition *αλσος*, nemus.

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nemus. *Οπταυ*, *affo*, ab, *οπτοι*, *affus*, says Scheid, quod ab *οπτα*, quod idem atque *οκκ*, et *ακκ*, *pungo pungendo figo*. But the parent word is *ἄρπη*, to roast; and *οπταυ*, to fry, *ἀπτα*, to kindle, *ἔλα*, to boil, are, with all their compounds, but the common offspring of this term. We shall only add one instance more from the Etymologicum of Lennep. *Οξχιουμαι* falto ab *οξκ*. Dicitur videtur a motu in altum. Componendum quoque est cum *ερχομαι* (venire.) Ab *οξω* factum ex *οξω*, hinc *οξίγω*, cum contentione moveo, pcc. in altum: unde facillima via ad *οξεχω*; *οξχω*, *οξχεω*. Rectissime igitur Etymol. c. 634, 52, *παρε το οξεχεν, και εκτεμειν τας χυμους—και ορχηστις Αρης, ο ευκρινος κατα πολεμους*. Unum tamen addidisse liceat, fecundum analogiam leges, ab *ορχος* (derivata voce verbi *ορχαυ*) pp. repetendum fuisse *ορχεω*, cujus Media forma est *ορχισμου*.

This paragraph is a fair specimen of the manner in which these etymologists have, by certain analogies, founded on their own fancies rather than on the real structure of the Greek tongue, yoked together under one common root words the most foreign to each other.

The verb *ορχεω* did not come from *ορχ*, or *ορχε*, but from *ארכ*, *areg*, to desire, or to stretch to an object, when desired. From the same origin are derived *ορχηνημι*, *ορχηθεω*, *ορχηθω*, *ορχητων*, *ορχησμου*, *ορχησσομαι*, *ορχαν*, and *αρχαν*, all of which are but different modifications of the same primitive words by different people who used the same tongue. On the other hand, *ερχομαι*, to come or go, originated in *ארכ*, *arukh*, or *ארכ*, *arek*, to travail, prolong, extend. On the other hand *ορχος*, which means a row of plants, or the order in which any thing is done, is from the Hebrew *ארכ*, *arek*, to arrange or place in order. From *ορχος*, arrangement, measure, rhythm, came the verb *ορχεω*, or *ορχισμου*, to move to the sounds of music in a dance or to battle. The movements in a dance and in war appear to have been regulated by the same measures; and hence dancers and warriors had the same names applied to them. *Mars* being called *ορχηστος*, as the author of the Etymologicum writes, *ως προς πολεμους εννοητος*. Hence, too, a leader, *i. e.* one who put the men in order of battle, was called *ορχησμος*; and, moreover, *πρωτος*, which denoted a species of dance, came in Latin to signify prælium. Such learning, acuteness, and diligence as were possessed by Hemiteruse, and the celebrated men above-mentioned of his school, however perverse, could not altogether have been misapplied. Their labours, therefore, must present some instances of just etymology, but their system, upon the whole, appears to us both fanciful and erroneous, and calculated more to perplex their readers than to furnish them with solid information.

Etymology, as it may serve to ascertain the primary sense of a word, to unfold a general principle in the formation of language, to exemplify the manner in which philosophical notions, political occurrences, and religious institutions influence the mind and give birth to new modes of speech, is a subject of rational and useful enquiry. In this enlightened view it blends itself with the history of philosophy, of politics, and of religion, with the structure of the human frame, and even with the theory of the human mind. Connected with any or with all of these purposes, none but the uninformed will neglect or decry this branch of philology as vain and useless; and without such connection none but pedants will pursue or extol it as worthy of attention. As the Greek originated in the Asiatic languages, a knowledge of these languages to a certain extent is absolutely necessary, to form a rational and competent etymologist in the dialects of Greece: and many passages must exist in the Greek writers, especially the more ancient poets, which can be understood only by light reflected from the East. It will not be foreign to our purpose to illustrate this position by

a few examples. The first we select occurs in Homer's *Iliad*, ii. 815:—

Εἰς οἱ τῆς προτοφρεῖς πόλει· αὐτῆα καλεῖται  
 Ἐν τῆσσι κταμένοι, Πιερίδος ἕβα καὶ αἴα,  
 Τοῖσι κείνοι· Βατῆα κληροσσομένη,  
 Ἀβασσοῖσι δὲ τῶ στήμα πολυσακέθου Μυρμιδῶν.

Of this passage the following is a literal version: *They exists apart in the plain, in the front of the city, (namely, Τυροῖς) a lofty mount, accessible by a circular ascent. This men call ΒΑΤΙΕΛΑ; but the Immortals the tomb of far-bounding Myrmidon.*

The language of the Trojans, though a dialect of the Greek, was, we may well suppose, from their situation, mixed by an influx of Asiatic terms. Of this class is *Βατῆα*, which in Hebrew is *בֵּית*, *beit*, and means an *abode*. In Isaiah, xiv. 18, and Job, iii. 15, it signifies the last home of man. The term here occurs in the Syriac form *בֵּית*, *buteea*, and has the sense which it bears in the Jewish scriptures. Hence we discover the meaning of the passage, which has escaped the knowledge of the critics, ancient and modern. *Βατῆα* means the same thing with *σῆμα*, and the clause, *πολυσακέθου Μυρμιδῶν*, is to be connected with the former as well as with the latter; and the import of the phrase is, *Men call it (Βατῆα) the grave, and the Immortals the tomb, of Myrmidon.* By *men* Homer meant the vulgar people of Troy; by the *Immortals* he intended the polished Greeks. Here we see the partiality or rather the pride of the poet respecting his language and countrymen. The phrase is purely oriental. The elegant Shakspeare styled *Daeb Nagoree*, writings of the Immortals. Conformably to the same lofty figure, Homer calls Greek, from its superior polish, *the language of the immortal gods*, while he characterizes the dialect of Troy, from its barbarity and rudeness, *the language of men*.

The explanation which the critics have given of *Βατῆα* is various, each rendering it more uncertain and improbable. Hesychius explains it to be *πολις Τεγαικῆ*. Others derive the term from *βαυ*, or *βανυ*, to go; and others again from *βατος*, *bramble*, because, as Heyne says, *collis sentibus obductus esse potuit*. As the commentators did not know the origin or meaning of the word, it is not to be expected that they should understand the singular phraseology grounded upon the use of it. Eustathius's account of it is, *το μὲν ἕλας κρείττον των ονοματων θεου: ἐδῶσαν δὲ τῶσι; the poet ascribes the best name to the gods.* The scholiast says, *το μὲν προσημοσσομενον ονομα εἰς θεου: αὐ. φερε δὲ παλαιος, το δε μῦθος αἰωνιος: αὐθῆσσομο:; the poet refers the more ancient name to the gods; the more recent name to men; which cannot be true: for Βατῆα is at least equally ancient with *σῆμα*. Clarke comes nearer the truth, who supposes the language of the *Immortals* to mean the language of the learned; and this great critic would have seen that Homer intended to contrast not the language of the learned with the vulgar Greek, but the polished language of the Greeks with the barbarous dialect of the Trojans, if he had been aware that *βατῆα*, in this dialect, meant a *tomb*, or the same thing with *σῆμα*. We shall only observe that this word exists in Celtic, and bears the same signification—*bedd*, *a grave*.*

The next passage in which the use of the Oriental tongues serves to illustrate obscurities in Greek authors, we shall select from the *Agamemnon* of Æschylus. On this paragraph much has been written, and written in vain by the critics. *Clytemnestra*, the lady Maubeth of ancient days, boasts in it of her fidelity, during the absence of her lord, and the joy with which she would receive him on his return.

Οὐδὲ οὐδα πρὸς ἡ, αἰεὶς αὐτῶν ἰσπῆ,  
 Ἄλλου τρος ἀνδρῶν μαλ' ἔτι χαλκοῖ βατῶ.

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The lines are thus rendered in the elegant and poetical version of Mr. Potter:

—————Never knew I pleasure  
In the blamed converse of another man,  
More than the virgin metal in the mines  
Knows an adulterate and debasing mixture.

On this passage the author has the following note: Pausanias says, "aliquid subest quod non intelligo." Mr. Heath disapproves the allusion, though he thinks it a proverbial expression, the grace of which is lost on our ignorance, and says, "quod nos non videmus alius olim forsitan videbit."—In the old Persian called the *Pehlvi*, the first principle of things was called *𐬨𐬀𐬎*: and though supposed to be fire by the disciples of Zoroaster, the term is a modification of *𐬨𐬀*, *ab*, water, which the Arabians maintained to be the original element. With the notion that water is the primary matter, the early Greek philosophers appear to have borrowed the term. Hence *επιτιναι*, to plunge, (which Lempzinger absurdly deduces from *επιτιναι*): hence too *επιτιναι*, immersion; and the phrase *χαλκον βαλσαι* is a metaphor for a *stab* or *swindal*, it being produced by a weapon plunged into the body as into water. The sentiment which the words convey to the herald, whom Clytemnestra addressed, is to this effect, *I know no pleasure with any man, and feel no more the sting of calumny, than the point of steel*. But the language is studiously equivocal; and in this peculiarity consisted at once the skill and the obscurity of it. While the queen appeared to express the above meaning, she in reality expressed quite the reverse. I know no greater pleasure, though no report more disgraceful, than a steel plunged in him, (namely Agamemnon,) by another husband. This artful equivocation arises from the manner in which the clause *αλλου προς αλλου* is connected. If taken with *μετα* the lines convey the *first* sense; but with *χαλκον βαλσαι*, they convey the *last*.

For this interpretation we have the best authority, namely that of the *Chorus*, who were present: who, perceiving that the herald was misled by the artful ambiguity of the words, hints at their true signification as soon as the queen withdrew from the stage.

Αυτη μιν ουτως οπως μαλιστα σοι  
τορσιση λεγουσιν επιπρασιν λογον.

Which may be thus rendered: *This woman hath told thee learning (she who hast yet to learn) what she is, a tale which discerning interpreters perceive to be very becoming,—well to become her character and views.* Here *τορσιση λεγουσιν* depend on *επιπρασιν*; and the *Chorus* intimate, that her words, understood, as they seem to have been by the herald, were false and unbecoming, but strictly true and appropriate in the sense in which *they*, who knew the woman better, had reason to regard them. Taken in the first sense, the metaphor *χαλκον βαλσαι* is too violent for the simplicity of the sentiment; and the falsehood, moreover, is so glaring as to class the queen with the basest of deceivers, without a trait of that masculine intrepidity and elevated ardour with which she pressed to the object of her desire. In the latter it exactly suits the dark ambiguity of prophetic language; and the boldness of it is in unison with that vehemence and glow of pleasure, with which she anticipated the plunging of the weapon in the bosom of her husband. For these reasons the *Chorus* justly pronounce her language *επιπρασιν*, as at once expressive of her true feelings, her artifice, and her intrepidity.

Lycophron, who flourished under Ptolemy Philadelphus, is known to have studiously affected the use of hard and ob-

scure terms, which, from their antiquity, must demand the attention of Asiatic scholars. In his *Cassandra*, the only remains of his voluminous productions, occur these lines:

Υλαμπαι σ' σχισται; και Φερεκλειου τοδαι;  
Διστας σιλημυθαι; κατ'αυτ' Γυβου πλακας;  
Εν οισι προς κινουσα, και ποδων σχισσας  
Πλευρησ' οδουσαι; ιασησιν; πληρμυθουσαι.

They contain a prophetic address to Paris, now commencing his expedition for the rape of Helen, and may thus be literally rendered:—*The ship and feet of Pherecleus will bear thee to the two ports and coasts of Gythium, having in these fixed to the rocks the crooked teeth of the pine, Hector's (i.e. sustainers,) of the flood.* Pherecleus as an artist constructed the ship, and as a soothsayer, consulted the gods, and endeavoured to conciliate them to the projected expedition. As such, he was naturally led to give the vessel the name of *τραυπη*, which with the Greek termination is the Chaldean and Phœnician term for the tutelary gods, *trayim*, or *trayim*. The scholiast says, it is the name of a *foreign ship*; and in this he is followed by Hesychius. It was certainly usual to carve the images of the gods on the ship, which they were supposed to protect; and to them the sailors fled in seasons of danger. (See Hor. i. 14.) The figures, which at this day are often framed in the forepart of the ship, are but the remains of the same custom. The practice, no doubt, originated with the Phœnicians: and it was natural for them to call their ship by the name of those gods which were supposed to preserve them. The rudders, the oars, the sails, by which the vessel was moved, are here affectedly called the *feet* of Pherecleus, he being the author of them. Of the derivation of the term the scholiast and Hesychius appear equally ignorant, and the whole of this passage is a striking instance how incompetent the ancient commentators were to explain in many places the terms of the Greek tongue.

The ancients had statues of their gods erected before their doors, and in the entrance of their harbours. These received the salutations of strangers and passengers. Lucretius mentions this custom in his first book. Hence the doors and ports received the name of *επιπρασιν*, as being places where the gods were *saluted*, from the Arabic *سَلَامٌ*, *salām*, salutation. The account which the scholiast gives of this term is ridiculous: *σκλημυθαι δε οδουσαι λεγουσιν, πρηναι τοις σκλημυθουσιν.* The explanation of Hesychius is more rational, though not the true one; *σκλημυθαι οστιν δε οδουσαι σκλημυθουσαι.* This is a fair specimen of the manner in which the Greek words, derived from the East, are explained in the old glossaries. But farther, *πλευρησ'*, *coasts*, is the Hebrew *פְּלֵאָה*, *plag*, or *plag*, (the vowels being arbitrary, and not existing but as included in the consonants of the original,) and signifies to divide, and thence as a noun any thing divided, such as portions of the land and sea. From the same original is derived *πλευρα*, as serving to divide the earth into distinct territories; hence too, the Latin *plaga*, a climate or region. Finally, the unusual term *κινουσα* originated in the Persian *linear*, an extremity or limit which, as the limits of a river came hence to signify its *banks*; as the limits of the sea its *shore*, or the *rocks* lining them. The limits of a door are its *poils*; and hence the Celtic word *kyner*, the door poils; and probably from the same source, on account of their remoteness, has been derived the appellation assigned to the Canary Islands.

The attempts of Paris, under the auspices of Pherecleus, to appease or conciliate the gods, are alluded to by Horace, lib. i. 15. who appears to have had the passage of Lycophron in his view. Pherecleus, the first adviser, perhaps,

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of the expedition, is represented by Homer as properly punished; for he received an ignominious death from the hand of Merion. The poet adds, *Il. v. 65.*  $\epsilon\pi\iota\ \sigma\omega\tau\iota\ \beta\iota\alpha\iota\omega\ \epsilon\beta\epsilon\sigma\tau\alpha\tau\epsilon\ \gamma\acute{o}\nu$ , since he did not at all know the decrees of the gods. To say that Pherecleus did not possess this knowledge, appears not only a profane, but an unnecessary saying: for who is the man that is acquainted with the divine decrees, while yet unfulfilled? But when it is considered that Pherecleus had *pretended* to be so knowing, and probably predicted ultimate success, while the event turned out very different from his predictions, there is much propriety and even point in the remark; since it holds forth the *diviner* as a *deceiver*, who by his impostures brought ruin upon himself and his country. From this we may conclude, that the beauties of Homer, who confines himself beyond any other poet to general nature, yet in many instances depend upon circumstances unknown to, or unobserved by modern readers.

The prevailing taste for oriental literature promises to contribute much to the improvement of philology. And when classic scholars shall engage with due attention in this pursuit, the more ancient Greek writings will share in the general benefit, by the light reflected upon them from the East. The derivation of the Greek from the oriental tongues, the frequent use of terms which Homer, Hesiod, Lycophron, and others have adopted in their primary significations, have occasioned difficulties which a critic, however able, but versed only in Greek and Roman authors, is hardly able to solve. These difficulties, instead of being explained, have been glossed over by the futile etymologies of the ancient scholiasts and lexicographers: and they can be properly felt and successfully removed only by those who have extended their study from the elegant language of the Greeks, to the no less polished languages of Persia, Arabia, and Judea. Of this position the examples above cited afford sufficient illustration: and they are, it is hoped, too curious, new, and solid, not to be undeserving of a place in a dictionary of science.

In the last place, the derivation of the Greek from the ancient languages of the East, will account for the origin of the much disputed *digamma*. In these tongues gutturals abounded, which, like other consonants, contained in themselves the vowel necessary to their pronunciation. But it is the tendency of every guttural, when become habitual, to soften down, in the rapidity of utterance, into a mere aspirate, till it at length vanishes. Thus *cornu* has degenerated into *horn*;  $\chi\epsilon\rho\sigma$ , into *homo*, earth, and into *homo*, a creature of earth, man. Thus also the Hebrew  $\text{חַי}$  ( $\chi\alpha\iota$ ), which signifies *life, soul, self*, appeared in Greek in the form of  $\text{χαι}$ ,  $\text{χαι}$ . Moreover  $\text{כַּבֵּד}$ , *kabud*, a liver, gave birth to  $\text{καβειν}$ . This word retains an unquestionable mark of its derivation, for it has the form  $\text{καβειν}$ , *kabed*, or,  $\text{καβειν}$ , *kabar*: and this variation has been transfused into the Greek  $\text{καβειν}$  and  $\text{καβειν}$ . Hence we obtain the origin of the aspirate placed over a vowel. It was originally a guttural, which losing its power as a consonant left the included vowel behind, with an inverted comma above, to perpetuate that part of the letter which fell into disuse.

The guttural, when softened into an aspirate, is apt to be diluted into a long vowel. Hence the reason why  $\eta$ , in the ancient Greek, seems to have been accompanied by an aspirate, as in  $\text{ἠτα}$ . On the same principle that a guttural softens into an aspirate, the aspirate often melts into a gentle breathing, or becomes in pronunciation quite quiescent, as the Latin *honor* and *honestus* become in English *honour* and *honest*, the *h* being mute. On the same principle *ough* became silent in our tongue, as in *taught*, *fought*. So in the Greek

$\text{ἄσπῳ}$ , *khaan*, a king, has degenerated into  $\text{ασπασ}$ , which Homer pronounced  $\text{ασπασ}$ . This leads us to remark, that the aspirate, instead of vanishing, was changed into a labial letter *w, v, b, f, or z*. Thus laugh, cough, which are still strong guttural sounds among our northern neighbours, are founded *lass*, *coff*, among us. Thus also in Greek, what was at first written  $\text{χαισσεια}$ , was pronounced  $\text{χαισσεια}$ ; and the words  $\text{χαι}$ ,  $\text{χαι}$ ,  $\text{χαι}$ , were founded  $\text{χαι}$ ,  $\text{χαι}$ ,  $\text{χαι}$ , or *foi, foi, fo*.

But the digamma did not always originate in a guttural, but sometimes in consonants allied to our *w* or *y*. Thus from  $\text{γῆ}$ , *gido*, is derived the Greek  $\text{γαια}$ , which in Homer is founded  $\text{γαια}$ , because the original is *yido*, hence the Latin *viden*. So again from  $\text{γιν}$ , is taken  $\text{αἶνῳ}$ , *win*, founded  $\text{αἶνῳ}$ : hence *vinum*, and *vine*.

We have already observed, that in Hebrew every consonant contained in itself the vowel necessary to its pronunciation. This vowel the Greeks detached and gave it a separate existence, by subjoining it to the concomitant consonant. And as the Hebrews seem at first to have founded every consonant, thus dividing each word into as many syllables as it had of consonants; and as they farther seem to have used vowel only in conjunction with consonants, and to have considered them as unfit to be employed alone and independent, so the Greeks, in imitation of them, used at first only short vowels: they next adopted the long or compound vowels  $\eta$  and  $\omega$ ; but still avoided the diphthongs, and when any two vowels concurred, they converted the first of them into a labial consonant. Thus,  $\text{λαμπετοοντι}$ , was founded not *lampetooniti*, but *lampetowonti*, or *lampetoxonti*; and  $\text{μουσαυει}$ , pronounced *mousawon*, or *mousawon*:  $\text{μυσι}$ , *weis*.

This letter is called *digamma*, because it has the form of two *gammas*, one upon another like our capital F, and also called *Æolic*, as supposed to belong exclusively to the *Æolic* dialect. But this account of it proves, that it did not belong, as Dr Bentley and others have supposed, to the *Æolic* dialect only, but to all the dialects of Greece, in their more ancient mode of pronunciation. It follows also that the universal opinion of the learned, who say that the *digamma* at first prevailed, and was afterwards succeeded by the *aspirate*, is the reverse of the truth. For the true state of the case is, that gutturals at first prevailed; these softened into mere aspirates; and these again were changed for a more easy and agreeable letter, which being simply a labial was diversified by different people into  $\gamma$ ,  $\text{αἰ}$ ,  $\text{αἰ}$ ,  $\text{αἰ}$ ,  $\text{αἰ}$ , or *f*. But the digamma, it will be said, is to be found only in Homer, by far the most ancient writer of Greece, while the aspirate is in all the more recent authors. The answer is this: the use of the aspirate obtained in the written language, and was therefore, less susceptible of corruption. On the other hand, that of the digamma prevailed in pronunciation, which was more liable to change, and to deviate from the original terms. Homer, we may naturally suppose, adopted the first in composing and reciting his poems, and the last in reciting them to the people. The written form, we may presume, was at first used but little, but prevailed by degrees; while the peculiarities of pronunciation in their turn began to decline. The language, as written by Homer, at length became fashionable in the conversation of polished people, and the aspirate, being thus triumphant in the daily converse of learned men, would of course, in their writings, triumph over oral and temporal corruptions.

The change of a guttural into an aspirate, or into a long vowel, or into a labial letter called the *digamma*, is not peculiar to any one language, but is founded on the structure of the organs of speech; and instances of it prevail in all languages, both ancient and modern.

The preservation of the aspirate in the written language of Homer,

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Homer, while the *digamma* was used in reciting them, is a proof (if a proof be wanting) that Homer did actually use a *written* language, and that his works were preserved by a written language; otherwise the aspirate would have been lost, and the *digamma* alone would have prevailed in all the Greek authors who succeeded that celebrated bard. If an editor of Homer in modern days would insert the *digamma*, he would corrupt the original orthography of Homer, and substitute in the room of the original characters the corruptions of pronunciation.

We shall now make some observations on the leading parts of speech, which may serve to unfold the peculiar nature and amazing extent of this language. As gender is the distinction of sex, there cannot in strictness be in any language more than *two* genders, masculine and feminine; nouns expressing inanimate objects, or things without life, being in a philosophical sense *neuter* or *neither* gender. But neuter nouns had by analogy assigned them the terminations of masculine and feminine nouns; and unfortunately for Greek, and the other European languages affected by it, the termination became soon regarded as an index of the gender, without any reference to the meaning. Thus nouns designating females ended in *α* or *η*; and for this reason the names of inanimate things, and also adjectives, having the same ending, are said to be *feminine*. For the same reason nouns in *ο* or *η*, though meaning things without life, are generally masculine, because these happened to be the predominant terminations of the names of males. There are, therefore, in this language two principles which regulate the gender of nouns, the signification and the termination: the former ascertaining the gender of living things, or things whose sex it is of importance to distinguish, the latter that of inanimate objects. There is, however, a third principle, on which is founded the distinction of gender, we mean the analogy which inanimate objects sometimes have to living creatures. There are some terminations common to males and females, and these afford such analogy an opportunity to operate. Thus *λογος*, reason, though expressive of what is neither male nor female, is made masculine, as signifying the commanding and the most excellent faculty of the human mind; whereas *βίω*, *away*, from its affinity to *γη*, the earth, or from the passive nature of its signification, a characteristic more of the female than of the male, is made feminine. That this analogy is not fanciful might be proved by many instances. In Aristophanes *βροτο*, is masculine; but Theocritus (*Idyl.* i. 132.) in representing it as producing *violet*, makes it feminine. This affinity to the female sex is the reason why *arbor*, with the specific names of trees in *us*, are always feminine, though the termination is decidedly masculine. In cases where the termination absolutely belongs to the names of males or females, this principle of *analogy* necessarily gives way to the termination. Thus, because *η* final is invariably appropriated to feminine nouns, *θαλασσα*, the *sea*, is feminine: on the other hand, *χρονος*, *time*, is masculine, from its termination as well as from analogy.

Nouns and verbs in Greek have a *dual number* to express two things, or such things as are in pairs, as hands, eyes, feet. The use of the dual occurs frequently in the poets, though not peculiar to them, nor always observed by them, when speaking of two objects. The dual number is by no means necessary in language, though it may enable the Greek to express the number two or pairs with more emphasis and precision. It was, therefore, rejected by the Æolians and by the Latins, who derived their tongue from the Æolic dialect. The seventy translators, moreover, have rejected the use of the dual number, and in this they

have been followed by the writers of the New Testament and the Greek fathers.

*Cases* have been defined by all modern grammarians to be *changes* in the termination of nouns; but the name *πρωσις*, in Greek expressive of cases, clearly shews that this is not the primary meaning of a case. For *πρωσις* means *a fall*, and, from signifying *a fall*, it came to signify the place in which a noun falls in a sentence. The idea, then, which a case at first expressed is the *position* of a noun in a sentence, and by that position expressing the relation of one word to another. Thus, if a noun denoted the *direct* subject of a proposition or discourse, it is said to be in the *right case*, *πρωσις ορθη*, *i. e.* the direct or straight position; but if a noun expresses an object or quality *indirectly*, it is said to be in an *oblique position*, *πρωσις παραγωγικη*, and this deviation from a direct to an indirect position, as the subject of discourse, is in the language of grammarians farther called *κλιση*, declension. Farther, cases express the relation of things in motion or action, and the relations necessary for the purposes of language are chiefly the following: the relation of *cause*, the relation of *effect*, the relation of *beginning*, the relation of *medium* or *instrument*, and the relation of *end*. A noun denoting the relation of cause, *i. e.* denoting the agent of an active or the subject of a neuter or connecting verb, is in the *nominative*; that of effect in the *accusative*; that of beginning in the *genitive*; that of medium or instrument in the *ablative*; and that of end in the *dative*. The nominative alone is called the *right* or direct case, the rest are all deemed *oblique* cases; though the accusative, as expressing a direct part of a proposition, might more properly be called a right, than an oblique case.

Moreover, the relations of bodies in motion or action were at first expressed by *prepositions*: and as our ideas of relation arise from the things related, and which succeeded them in their formation, prepositions should, and probably did, in the early use of language come after, instead of going before the nouns which they governed. In consequence of this arrangement, they combined into one word with the final syllables of the connected noun, and thus served to give it a diversity of terminations. Hence the origin of cases in the sense in which cases have hitherto been understood by modern grammarians. It is worthy of remark, before we quit this subject, that the nominative, as expressing *cause*, has a close affinity to the genitive, which means beginning. But the former fixes the attention on the noun, as an *agent* or a cause in action: while the latter holds forth its noun as the *source* or *beginning* of motion. The beginning of a thing is often the author and owner of that thing: hence the genitive has the secondary sense of *possession*. On the other hand, the accusative is nearly allied in sense to the dative; but the former is not used in its strict and original signification, unless it denotes an *effect*, or the thing in which *action* terminates; while the latter, in strict propriety, marks the end to which *motion* points, and in which it terminates. The genitive stands opposed to the dative, as beginning to the end, like the opposite points of a right line; while the ablative expresses the medium or instrumentality of the motion by which that line is generated. The ablative case therefore denotes one of the most important and distinct relations in language, and yet the Greek, with all its boasted copiousness and precision, has not a distinct termination to express this case, but denotes it sometimes by the genitive, and at others by the dative, with or without a preposition. Finally inanimate things only move after they are put in motion, or act as they are acted upon. This is probably the reason why neuter nouns in Greek have no termination to express cause, distinct from



that which marks effect, that is, why the nominative and the accusative of Greek neuter nouns are always the same.

A multitude of nouns in all languages express the abstract ideas of action, and consequently are derived from verbs, as subsequent to verbs in their formation. Our ideas moreover of the persons, the characters, the offices of men, are derived from the same sources; and from verbs are derived the nouns which express those persons, characters, and offices.

The name of the actor is derived from the corresponding verb by adding τος, ρος, υος; as μαθεῖν, to learn, μαθητής, the person that learns, a learner; ἰχθυεῖν, to seek, ἰχθυήτης; μαινεῖν, to enquire, μαινεύς, the person who inquires; σπυριεῖν, to sow, σπυριεύς, a sower.

Nouns expressing the action of the verb abstractedly considered, or the effect of that action, are derived from the corresponding verbs by adding σι in the room of the final ω; as τερπειν, to delight, τερπασι; τερπεῖς, delight, the act of delighting; τυχεῖν, to produce; τυχασι, τυχεῖς, the act of producing, production; κριθεῖν, to judge, κριθασι, κριθασι, judgment. Hence it is evident that verbs in τω or τει, βω, ζω, must have their corresponding nouns in Δις: those in ω, γω, χω, and those in στω (for σω) in Ξις; and those in ζω and στω (for ζω) in Σις. The penultimate vowels α and ε are changed into η, and ε into ω; as μαθεῖν, to learn; μαθητής, instruction; ὀρθοῦν, to rectify; ὀρθότης, rectitude.

Other verbs are changed into abstract nouns by changing the last syllable into ης or μος, or simply into η, the penultimate ε being changed into ο after the analogy of the perfect middle; as βλέπειν, to see; βλέπμα, βλέπμος, a sight; κριμα, κριμα, judgment; τρυφω for τρυφω-ω, to prurice; τρυφωμος, a prurice; ἀρπαζειν, to plunder; ἀρπαζωμος, plunder; ὀριζειν, to define; ὀρισμωμος; definition; φθειρειν, to corrupt; φθειρη, corruption; σπυριεῖν, to sow; σπυριεύς, seed.

Adjectives are converted into abstract nouns by changing the last syllable into ητις, or into ητις, or into ας, or into ης; τωος, qualis, such; τωοσις, quality; κωωος, base; κωωοσις, baseness; μονο, alone, or one; μονωος, the number one, monad; ὀωος, ὀωοσις, the number two; ἀλωωος, true; ἀλωωοσις, truth; ὀωωοσις, approved; ὀωωοσις, approbation.

Adjectives, being the names of qualities, are taken from the names of the objects to which those qualities in a prominent manner belong; as ὀωος, an ass; ὀωοσις, contemptible; ἀνεμος, wind; ἀνεμοσις, windy; ὀωωωωωσις, empty, like the wind. But adjectives are derived from nouns by annexing to them the verbs expressive of similitude, ὀωωσις, like; ὀωωσις, resemblance; ὀωωσις, such, like; as ὀωωωωωσις, a man; ὀωωωωωσις, man-like, manly; ὀωωωωωσις, for ὀωωωωωσις, man-like; also ὀωωωωωσις, for ὀωωωωωσις, having the form of a man, manly. This composition is the origin of that class of nouns called patronymics. Πηλεωος, Πηλεωωσις, one having the form of Peleus, i. e. the son of Peleus.

There are in Greek but two personal pronouns, that is, substitutes for nouns, or, as we have explained them in the article GRAMMAR, numeral adjectives, assuming the character of nouns by association with the verb. These are ἐγω, I; συ, or tu, thou; and they are evidently derived from the Hebrew אָנֹכִי, anke, I, which in Greek is written in the various forms of ἑγω, ἐγω, ἐγωσι, ἐγωσις, ἐγωσις; ἀτά, and by dropping α, ἑγω, ἐγω, or the Æolie τω: ὀω always expresses the subject or agent in one of the oblique cases, and therefore, as not wanting, has not a nominative case. Its origin is the Hebrew אָנֹכִי, kbi, life, soul, self; which latter is the sense of ὀω. Pronouns of the third person are only definitives or restrictive adjectives agreeing with the noun defined, expressed, or implied. The chief of these is ἐ, the, he, which very improperly

has been called an article; whereas it is a definitive derived from the Hebrew אָנֹכִי, ba, which, as an abbreviation of אָנֹכִי, an, serves to direct the attention to an object, and thus to distinguish that object from all other things. ὀ, ὀω, ὀωσις, the same, ὀωσις, this, are but different modifications of ἐ. In speaking briefly of the verb, we shall do little more than copy Mr. Jones's system, as explained in that part of his Greek grammar where he treats of the origin of verbs. This system is founded on the Hebrew tongue, in which all the varieties of mood, tense, number, and person arise from the combination of the personal pronouns with a radical noun or verb. Though a multitude of abstract nouns are borrowed from verbs, yet all or most of the Greek verbs are nouns converted into verbs, by annexing to them the personal pronouns. His own words are: We acquire the ideas of action by reflecting on ourselves, or observing others in certain circumstances; and the most simple way which nature could at first suggest of expressing these ideas was to combine the name of the person or thing which acts with the person or thing acted upon. Thus ἐγω; and ἐγω joined, and abbreviated, is ἐγω; and this term would be sufficient to express I drink wine, though it originally meant only wine I: association supplying to the speaker, and to the person addressed, the intermediate notion of drinking. From this account of the origin of verbs, he deduces three conclusions of importance to be observed. First, verbs were originally the names of things; and thus received their characters as verbs from association. Secondly, that every verb consists of a pronoun expressing an agent, and of a noun or the substitute of a noun expressing an object. Thirdly, that the terminations, ο, η, υ, ι, ω, ομω, ης, ωσις, were originally the personal pronouns, and from these, with the changes which they underwent, have proceeded all the variations of mood, tense, number, person and voice.

The first person, ἐγω, is a fragment of ἐγω; and by the same analogy that ἐγω becomes ἐγω, verbs in ω are changed into verbs in ἐγω; as ἑγω, ἑγωσις, to place, ἑγω, or ἑγω, ἑγωσις, to fix; ἑγω, or ἑγω, ἑγωσις, to give; ἑγω, or ἑγω, ἑγωσις, to bear. The personal terminations of verbs in ἐγω are therefore but a modification of these in ἐγω, and consequently a modification of the personal pronouns ἐγω, ἐγω, ἐγω, ἐγω, ἐγω, ἐγω, ἐγω, ἐγω. On this principle the verbs in ἐγω, which grammarians have hitherto divided into four distinct classes, are, according to Mr. Jones's theory, but one class, having each the same personal termination, and differing only by different modes of contraction; as ἑγωσις, ἑγω, ἑγωσις, ἑγωσις; ἑγωσις, ἑγωσις; ἑγωσις, ἑγωσις; ἑγωσις, ἑγωσις. This complex species of verbs is hence reduced into great simplicity, and the acquisition of them rendered very easy. The first person optative, even of verbs in ἐγω, conforms to the analogy of verbs in ἐγω, ἑγωσις, which originated in ἑγωσις, though obsolete. From this source the Latins have derived the final m, amabam.

The second person in Hebrew is אָנֹכִי, thou, or tu, a fragment of אָנֹכִי, ata. Hence the Ionians formed this person in ἑγω—ἑγωσις, thou knowest; ἑγω, thou sayst. The above fragment, consisting of th or t only, has been corrupted into s. Hence the second person in every tense of the active voice terminates in s, with ε or α short preceding. The subjunctives ε, ε, form no part of the original pronouns, but were inserted, as is often the case, to lengthen the preceding vowel. The third pronoun in Hebrew is אָנֹכִי, he, which is the parent of he in English, and in Greek of ἐ. This, with the subjunctive ε, forms the third person, ἑγωσις. To the original ε the Ionians added σι. Thus in verbs in ἐγω, ἑγωσις,

σ' τ, for τ', and in the subjunctive of verbs in α, we meet with ὄστω for ὄσω. In Sanscrit, a language which has a great similitude to the Greek, *ju* or *sub* means *be*.

In Arabic the ordinal of *two* is *tan*. Hence the Greek dual τὸν or τῶν, τὸ τριτὸν, or τὸ τρίτον, *they two beat*. The personal termination in the plural are all formed from the singular. Thus τῶν, by the analogy of the third declension, is τῶν, and in this form it was used by the Doric, the most ancient dialect of Greece, τὸ τριτὸν, ἐσὺ τριτὸν. In the common tongue the final τ became corrupted into ν. The second plural is the same in its origin with that of the singular τῶν or τῶν τριτῶν, and the third plural is the same with the third singular differently contracted, τήνισι τήνισι, *he places, τήνισι, they place*. The third of verbs in α is formed from the third of those in μ, with the subjunctive υ annexed, τῶν τριτῶν, τῶν τριτῶν, which is the Æolic form, and hence in the common tongue, τῶν τριτῶν. The vowel ε, not only in single instances, but in whole classes of words, is changed into ο. Thus in the formation of nouns from verbs τριμῶν, *to cut, τριμῶν, a fæction*; in forming the perfect middle, πείθε, *to persuade, πειπέθε*, and sometimes the perfect active βρέχευ, *to rain, βεβρέχευ*; in forming circumflex from other verbs, ἄρμευ, *to tremble, τριτῶν*; by corruption in single words ὀδῶντες, ἔδῶντες, *teeth, γῶν, genu*. On the same principle the Æolic ὄστω became ὄσω.

The personal terminations of the imperfect or past tense in μ, are ῶν, ῶν, ῶν, ῶν, ῶν, ῶν, ῶν, ῶν, ῶν; as ἄρμευ ἐπι-ῶν, ἄρμευ ἐπι-ῶν, ἄρμευ ἐπι-ῶν, ἄρμευ ἐπι-ῶν. These are also formed, according to Mr. Jones's theory, without the reduplication, ἄρμευ ἐπι-ῶν, ῶν-ῶν ἐπι-ῶν, ῶν-ῶν ἐπι-ῶν. These are hence contracted either with or without the reduplication; ἐπι-ῶν ἐπι-ῶν, ἐπι-ῶν ἐπι-ῶν, ἐπι-ῶν ἐπι-ῶν. By the conversion of ε into ο, on the principle above illustrated, the personal terminations of the verbs in μ, it was that ε, ῶν, &c. became ῶν, ῶν, ῶν, ῶν, ῶν, ῶν, ῶν, ῶν. The first person singular in Hebrew is עָשִׂיתִי, *est*. Hence the personal termination υ or ω. The third plural ῶν, or ῶν, is the Persian ۱۰۳, *estan*. Hence we read ἄρμευ in verbs in υ, and τήνισι in verbs in μ; but ῶν is contracted in the common tongue into ω; as ἐπι-ῶν, ῶν.

The second aorist is the same tense with the imperfect, and verbs of the imperfect differ from verbs of the second aorist, not because they express different modifications of past time, but because they came from different roots. Thus, from τριπτε and σπιπτε are derived the imperfect τριπτον and σπιπτον; while ἐπι-ῶν and ἐπι-ῶν, in the second aorist, have been deduced from the obsolete τριπτε and σπιπτε; as is the signification, so are the terminations the same in both. The pluperfect has its personal terminations from the imperfect, by annexing the subjunctive ι in each person—ῶν, ῶν, &c. ῶν, ῶν, &c. The characteristic of the first future is σ inserted before the final α of the present—τριπτε or τριπτε, τριπτεω τριπτε, λήν, λήσκει, λήσκει. And what grammarians call the second future, is no other than the first future, where, after a very general analogy, σ is dropped. Thus, βλάξαι, 1 fut. βλάξαι, ἔβλαξε; ἔρχαι, 1 fut. ἐρχαι, ἔρχαι, ἔρχαι, ἔρχαι, ἔρχαι, contracted ἐρχαι. So τριπτε, said to be the second future, is a contraction of τριπτεω, from the root τριπτεω. And this observation holds in regard to all other verbs supposed to be the second future, while, in fact, no such tense exists.

The subjunctive mood is derived from the indicative, by changing ε into υ, ο and ω into υ, and subseribing ι where it occurs. It is thus formed, in every tense, through the active, the passive, and the middle voice. Thus, τριπτε, τριπτε, &c. have given birth to τριπτε, τριπτε, &c.: so, in the first future, τριπτε, τριπτε, τριπτε, originated τριπτε, τριπτε, τριπτε,

which is not the first aorist, as is supposed by grammarians, but the first future, which is, indeed, proved by its signification, as well as by analogy: for, in all instances this tense expresses a future time, not absolutely so, but time future in regard to another verb connected with it in the sentence. The optative has its tenses, in general, derived from the corresponding tenses in the indicative, by changing ε into υ: but the first person, as has been observed, is derived from verbs in μ; as, if τριπτε, τριπτε, τριπτε, τριπτε. The third plural, like the third singular, follows the analogy of verbs in μ—τριπτεω, contracted τριπτεω; in the same manner as δεικτεω becomes δεικτεω.

The imperative mood, originally in the first person, retained ε of the imperfect tense; as λαβε, *let me receive*. Thence, dropping the final ε, it has, in the common tongue, the first person in ι—λαβε. The pronoun τυ, which, in Persian, is το added in the form of τ, conflutes the second or third person—τριπτε. And τριπτε, contracted into τριπτε, forms the third plural—τριπτεω, which, by dropping ε, is again abridged into τριπτεω, erroneously supposed to be the dual number. When a command is given, it is necessarily given in the present time, and it can be executed, not in the past, but in the future. It is impossible, therefore, in reason, that the imperative mood can have a past tense. Thus, τριπτε is the present imperative, or that of the second future; and τριπτε the first future, not the first aorist. In some of the dialects ε is substituted for the subjunctive vowel. On the other hand, the Ionians change ε, with or without its concomitant vowel, into ο. Thus, in the imperfect, for ῶν, or ῶν, they used ῶν, *I was*: for the pluperfect ἐπι-ῶν or ἐπι-ῶν, ἐπι-ῶν, which the Attics contracted into ἐπι-ῶν; and in the third person plural, of the passive form, for τριπτεω, they write τριπτεω, and for κειναι, κειναι. In the same manner τριπτε, which is said to be the first aorist, but which, in reality, is the first future, becomes, when τω is added, not τριπτεω, but τριπτεω. From the imperative thus principally ending in ω, we obtain the attic third person plural in ῶναι—τριπτεω, τριπτεω, which are contractions of τριπτεω, τριπτεω, the first being τριπτεω or τριπτεω, and τριπτεω for τριπτεω. By the above Ionic analogy, we also obtain what is called the Æolic first aorist, τριπτεω, which has the personal terminations of the first aorist indicative. It is thus changed from τριπτεω or τριπτεω, used for τριπτεω, in the same manner as ῶναι is for ῶναι.

The infinitive is formed by adopting ε, or, as it is in Hebrew, ἐπι-ῶν, and by adjoining ι, τριπτεω. In the perfect it has ῶναι, τριπτεω; but in the first aorist ε is dropped—τριπτεω, probably for τριπτεω, which, after the analogy of the perfect, would be τριπτεω. In the Ionic and Attic dialects, the infinitive, however, is formed from verbs in μ, though obsolete, τριπτεω, τριπτεω; δεῖμαι, or δεῖμι, δεῖμαι; δοῖμαι or δοῖμι, δοῖμαι; εἶμι, *I am, εἶμαι* or εἶμαι. To these, after the analogy of the perfect, is added αι—τριπτεω, δεῖμαι, εἶμαι, εἶμαι.

The passive voice is formed by combining the subject of discourse with the personal pronoun in the dative case—μοι, σοι, τῷ. Thus ἀκοῖ μοι, *house for me*; ἀκοῖ σοι, *house for thee*; ἀκοῖ τῷ, *house for him*. These combinations, which by a slight change become ἀκοῖ μοι, ἀκοῖ σοι, ἀκοῖ τῷ, came to convey the idea, *I have a house, thou hast a house, or I am housed, thou art housed*. And this is the reason why the passive form in all authors have either an active or a passive signification, the context alone serving to ascertain the sense of the verb. The dual τῶν is made passive by changing τ into σ—τριπτεω, τριπτεω and not τριπτεω; and it is worthy of remark, that in the first person plural ε takes σ before it very frequently, as τριπτεω for τριπτεω, and in the imperative ῶν for ῶν.

As the personal pronoun, combined with the radical word

word to form the passive voice, was *τρον*, the primary form of the verb must have been *τυπτροναι*, and not *τυπτομαι*; and in the imperfect *ετυπτροναι*, and not *ετυπτομαι*: but afterwards *ε* was changed into *ο*, as in other numerous instances. Hence the passive form of verbs in *α* was originally the same with that of verbs in *μ*: and this form had only two tenses, *μυ* for the present, and *μην* for the past. The second person singular is formed in the common tongue by dropping *σ*, and contracting the two succeeding vowels in every mood and tense. Thus *τυπτομαι*, *τυπτομαι*, *τυπτην*; imperfect *ετυπτοσα*, *ετυπτοσα*, *ετυπτοσα*; first aorist middle *ετυπασα*, *ετυπασα*, *ετυπασα*; optative *ετυπτοισα*, *ετυπτοισα*; *δυστι*, *δυστι*. The first future middle is derived from the first future active, by changing *ο* into *ομαι*, *ετιπσομαι*. The second future middle is derived from *ετιπσω*, (which is from the obsolete *ετιπαι*), *ετιπσομαι*. This drops *σ*, and is contracted—*ετιπσομαι*, *ετιπσομαι*. Hence what is called the second future is no other than the first future. The same obsolete radical has given rise to the second future passive, which is no other than the first future—*ετιπσομαι*, *ετιπσομαι*, *ετιπσομαι*; while the first future is from the obsolete in *δω* *ετιπαι*, *ετιπαι*, *ετιπσομαι*, *ετιπσομαι*; *λεγειν*, *λεξειν*, *λεξειν*, *λεξειν*, *λεξειν*.

The termination *ων* of the two aorists passive is borrowed from verbs in *μ*; and from this form, though obsolete, verbs in these tenses are in reality derived. Thus *ετυπην*, which is erroneously supposed the second aorist passive, is only the past of verbs in *μ*; as *εσπαυην*, (the obsolete of *εσπαυειν*) is *εσπαυην*; *ετυπην*, *ετυπην*. What grammarians call the first aorist passive is from verbs in *θη*; as *ετιπθη*, *ετιπθη*, *ετυπθη*; *λεχθη*, *λεχθη*, *ελεχθη*. In the third plural *σ* is dropped—*ετιπθησαν*, *ετυπθησαν*. So in the active voice, *ετυπτοσαν* for *ετυπτοσαν*; *ετιπθησαν* for *ετιπθησαν*; *ετυπασαν* for *ετυπασαν*; and *ετιπτοσαν* for *ετιπτοσαν*. In the infancy of language, while words were yet scanty, the most natural way whereby a writer or speaker might give an additional weight to his meaning, was to repeat such terms as he wished to render *emphatic*. The more ancient any language is, the more numerous appear the traces of such repetition; and, next to the Hebrew, they form a remarkable feature in the Greek tongue. Thus, *μυα, μυα, I desire, desire*, blended into one word, become *μυαα*, and means *I greatly desire*; *βω, βω, I walk, walk*; *βηβω, I stride*: and such words are numerous in this tongue; from which we may draw the following inferences.

First, that the augment is only the remains of a verb doubled, in order to augment the sense. Secondly, this augment takes place in the present tense as well as in the imperfect; as *παιω, παιω*; *αρχω, αρχω*; *δωρη, δωρη*. Thirdly, that the augment of the imperfect, and of the aorists, is but a corruption, still more remote of the reduplication; and that the dialect, which prefixes a consonant to the vowel like the perfect, such as *επιπρωα*, for *επιπρωα* is the most ancient usage, and comes nearest to the primitive simplicity of the language. Fourthly, the augment is applied to the first and second futures; and the effect of it is to increase the signification of the verb; *ετιπω, ετιπω*; *ακραζω, ακραζω*, *I will cry loudly*; *αταμα, αταμα*, *I will greatly fatigue*. Fifthly, that the form called by grammarians *plus quam futurum*, is not a distinct tense, but the first future middle augmented; *ετιπσομαι, ετιπσομαι*; *ετυπσομαι, ετυπσομαι*. Sixthly, that the augment of the perfect comes nearest to the original reduplication than that of any other tense, which is preserved still more distinctly in the augment of verbs beginning with vowels *αυαυα*, *αυαυα*, and the like.

The Ionians, we have observed, changed *ο* into *α*; and this analogy, perhaps, converted the imperfect form *ετυπτο*,

or *ετιπην*, into *ετυπτα*, or *ετιπτα*. The third person plural would be then *ετυπτασαν*. Hence the Boeotians used *ετυπτασαν*. The Dorians write *ετυπτασαν*, which, in the common tongue, is softened into *ετιπτασαν*. The simple and natural way of forming the perfect was to give it the characteristic of the present which it always implies, as an action, though past, still continuing in its effect; *ετυπτα, ετυπτα*; *λεγειν, λεγειν*. But from the facility by which letters of the same organs are changed for one another, *ετυπτα* became *ετυπτα*, and *λεγειν*, or *λεγειν*, became *λεγειν*. Hence *ετυπτα*, and *λεγειν*, which are improperly called the perfect middle, seem to have been the original perfect active, accidentally corrupted. And as there is no foundation for the distinction of perfect active and perfect middle, in fact there is none in signification. When, from whatever cause, *α* in some verbs became the characteristic of the perfect, it prevailed in other verbs, which still retained the characteristic of the present—*ετιπτα, ετιπτα*, *ετιπτα*. The distinction, therefore, of perfect active and perfect middle is a fiction of grammarians, founded on the interchange of similar consonants, or the blind impulse of analogy.

Prepositions form the most difficult part of the Greek tongue, not only because they, for the most part, govern different cases, but because each has a great variety of significations. Yet the author of the Greek grammar, above mentioned, has laid down two observations, which tend greatly to simplify this branch of the Greek language. The primary meaning of a preposition, says he, is to be sought in the root from whence it is derived, and the meaning so obtained, or one obviously connected with it, and flowing from it by analogy, it preserves in all cases whatever. A preposition combines with its own signification the meaning of the case in which the dependent noun is used; and it governs the genitive, the dative, or the accusative, as the writer wishes to fix the attention of his readers on the *origin*, the *instrumentality*, or the *object* of the governed noun.

We cannot forbear transcribing one instance (which is the first that occurs) of his manner of explaining the prepositions—*απο* (from the Hebrew *אפ*, *ab*, a *stem* or *root*; and as the root is under, the plant or tree springing from it, the primary sense of *απο* is) *under, below, from under a shield*. Further, the root of a tree is the *cause* of its growth; hence *απο* denotes the *cause* or *agent* of the action specified in connection with it. "And they were baptized by him, *απο* αυτου; he being the cause of their baptism." Finally, as a root shoot upwards, so *απο* to appear above the ground, *απο* is sometimes to be rendered *from under*—*απο* ζυγου *from under the yoke*—*απο*, (from the same Hebrew origin with *απο*; and as the root is the origin of a thing, it denotes *beginning, cause, origin*, and is rendered) *from*. As by the use of *απο*, the attention is directed backward to the beginning of motion, its governed noun is always in the genitive. "He was not able to see Jesus, *απο* οχθης, *from the crowd*," the crowd being the cause of his inability. From signifying, *beginning*, *απο* came to express the exact point of time at which motion begins. "They went *from supper*, *απο* δευτερα, *i. e. from directly after supper*. It expresses also the *distance* to which a thing has advanced, in consequence of moving. *απο* της γης, *far from the land*. The consequence of distance in which *απο* is *separation, or privation*, *απο* των οπλων, *from their arms*, *i. e. without arms*. Taken in this sense, *απο*, abbreviated into *α*, in Latin *ab*, becomes *a*, and compounded with nouns, adjectives, and verbs, imparts to them a contrary signification; *απο* της ζωης, *unvariable*. On the contrary, the effect of distance in some cases is *increase*, as a *Προμαχον* war, or the farther

it flows from its source, or as a tree becomes greater with its gradual expansion from the root. For this reason  $\alpha\pi\omega$  abbreviated, sometimes increases the signification of its compound.

The Greek surpasses almost all other languages in the number and variety of its terms; and the causes of its superior copiousness are, *firstly*, the many dialects which it comprehends, and which served to divide by accidental corruption the same primitive into many words; *secondly*, the facility with which nouns combined with the personal pronouns in the formation of verbs, and the great variety of ways the same noun may be converted into verbs, so as to form distinct verbs, yet allied in sense and found to each other; *thirdly*, the various ways in which verbs, adjectives, and participles have been changed into abstract nouns; and *lastly*, the great multitude of compound terms, formed by the union of verbs or adjectives with nouns, and of prepositions with verbs. The combination indeed of prepositions with simple verbs is the most fertile cause of the extent and comprehension of the language. The simple verb  $\beta\alpha\lambda\lambda\omega$ , thus combined, has given birth to no less than *fifty-two* compound verbs. This single instance sufficiently shews the genius of the language, and proves that, however few its simple primitive words may have been, its derived and compound words are in a high degree voluminous and varied, yet connected by an obvious and uniform analogy, both in regard to the formation and the meaning of each term.

But this language is not less remarkable for the harmony of its structure, than for the comprehension and variety of its terms. The perfection of language, as well as of music, depends on the melody of its sounds; their measure or rhythm, their variety, and their suitableness to the subject, which they are meant to describe or express. The circumstances of the Greeks in the earliest periods of their society, rendered them peculiarly attentive to all these objects. They lived continually in crowds; all matters of consequence were decided by the voice of the assembly, and next to the force of his arms, every warrior felt himself indebted to the persuasive accents of his tongue. The perpetual necessity of employing the power of eloquence, during the infancy of their political state, made them retain the original tones and cadences, by which men, as yet unpractised in the use of arbitrary signs, had made known their affections and their wants. These tones and cadences, imitating the language of action, (the first and most natural language of savages,) possessed a degree of energy and of warmth which can never be attained by the mere artifice of articulate sounds. By uniting them to these sounds, the Greeks gave all the force of a natural to an arbitrary sign. Music and action were incorporated in the substance of their speech; and the descriptive power of words was extended to all those objects which can be characterized by sound and motion, or which the various modifications of those qualities can suggest to the mind of man. Gillies' Hist. of Greece, vol. i. p. 238.

GREEK, *modern or vulgar*, is the language now spoken in Greece, and called  $\beta\alpha\lambda\lambda\omega$ , from Constantinople being called *Roma Nova*.

There have been few books written in this language, from the taking of Constantinople by the Turks; scarcely any thing but some catechisms, and the like pieces, composed or translated into the vulgar Greek, by the Latin missionaries.

The native Greeks are contented to speak the language without cultivating it; the Turkish politics not allowing any of the subjects of their estates to apply themselves to letters and sciences.

It is not easy to assign the precise difference between the *vulgar* and the *ancient* Greek: it consists of the terminations of nouns, pronouns, verbs, and other parts of speech, which make a difference between those two languages much like that observed between some of the dialects of the Italian or Spanish: we instance in those languages as being the most known; but we might have said the same thing of the Hebrew, Slavonic, &c. dialects. The *modern* Greek also curtails words, runs them into one another, and adds a sort of enclitic particles to the end of them: it confounds the vowels  $\alpha$ ,  $\iota$ ,  $\epsilon$ , and the diphthongs  $\alpha\iota$  and  $\epsilon\iota$ , which they pronounce and often write only *iota*. They likewise often confound cases, moods, tenses, and particles. See Breewood's Inquiry concerning the Diversity of Languages, &c. chap. 2.

Besides, the modern Greek has divers new words not in the ancient; particularly several participles which appear as expletives, and which are introduced to characterize certain tenses of verbs, and other expressions, which would have had the same meaning without such particles, had custom dispensed with them; divers names of dignities and offices unknown to the ancient Greeks; and abundance of words borrowed from the vulgar tongues of the neighbouring nations.

Accordingly one may distinguish three ages of the Greek tongue: the first ends at the time when Constantinople became the capital of the Roman empire; not but there were several books, especially of the fathers of the church, written with great purity after that time; but as religion, law, and policy both civil and military, began then to introduce new words into the language, it seems necessary to begin the second age of the Greek tongue from that epocha, which lasted to the taking of Constantinople by the Turks, where the last age commences.

GREEK *Lexicon*. See LEXICON.

GREEK *Masonry*. See MASONRY.

GREEK *Mass*. See MASS.

GREEK *Monks*. See ANACHORET.

GREEK *Orders*, in *Architecture*, are the Doric, Ionic, and Corinthian; in contradistinction to the two Latin orders, the Tuscan and Composite. See ORDER.

GREEK *Pitch*. See PITCH.

GREEK *Rite*, or *ritual*, is distinguished from the Latin. See RITE.

GREEK *Statue*. See STATUE.

GREEK *Testament*. See BIBLE and TESTAMENT.

GREEK *Valerian*. See VALERIAN.

GREEK *Wine*. See WINE.

GREEK *Year*. See YEAR.

GREEN, in *Biography*, an organ-builder, on the model of Snetzler, whom he succeeded, and has left behind him monuments of his skill and ingenuity in many of our churches and mansions of the nobility and gentry.

To this modest and ingenious man, ever ready to adopt any hint tending to the perfection of his art, we are indebted for the improvement of the mechanism of the most noble and comprehensive of all instruments, having eased the touch, voiced the pipes, and contrived a swell of the whole instrument, in a manner superior to any of his predecessors. He died when scarcely arrived at the midway of the period of mortal life.

GREEN, MATTHEW, was born, probably in London, about the year 1606. He was educated among the dissenters, and his learning extended to the knowledge of a little Latin. At this period, those who dissented from the established church were rigid in their principles and gloomy in their manners. He appears to have been, on this account, dis-

gusted with those who were the associates of his youth, and to have completely abandoned the party. He speculated freely on religious subjects, and at length adopted the system of outward compliance with established forms. At one time he appeared to be ready to join the quakers, but something occurred which prevented him from making an outward profession of their principles. His circumstances were very narrow, but he was fortunate enough to obtain a place of some trust in the Custom house. He died at the age of forty-one, in the year 1735. His disposition was remarkably mild, and his conversation abounded with wit. He was subject to low spirits: as a cure for this, he composed the work by which, as an author, he is principally known, "The Spleen." This poem presents a picture of his mind and manners, which implies a practical philosophy of the sober and rational Epicurean cast. The other works of Mr. Green consist of "The Grotto;" "Verses on Barclay's Apology;" "The Seeker;" and some smaller pieces. "In manner and subject," says the critic, "they are some of the most original pieces in the language: they rank among the easy and familiar, but are replete with uncommon thoughts, new and striking images of remote ideas by some unexpected similitude, in which wit principally consists. Few poems will bear more repeated perusals; and with those who can fully enter into them, they do not fail to become favourites." Gen. Biog.

GREEN, one of the original colours of the rays of light. Grass and herbs, and even all vegetables in places exposed to the open air, are green; and those in subterraneous places, or places inaccessible to the air, white and yellow. Thus when wheat or the like germinates under-ground it is white or yellow; and when it is in the open air, green; though this too is yellow before it be green.

GREENS, *Artificial*, are very rarely simple colours, but produced by mixture of yellow and blue.

Two powders, the one blue, and the other yellow, well mixed, appear perfectly green; though, when viewed with a microscope, we observe a chequer of blue and yellow.

The tincture of red roses with oil of tartar per deliquium, or with spirit of sal ammoniac, produces green. The tincture of many red flowers is changed into green by an alkali. The tincture of red roses, and the yellow tincture of crocus, or the blue tincture of cyanus, and the white spirit of sal ammoniac, produce green. The solution of verdigris becomes colourless by the affusion of the spirit of nitre, and by the affusion of the oil of tartar it becomes green again.

As no vegetable has yet been discovered, which is capable of giving to cloth of any kind a permanent green colour, the dye for this purpose is a compound colour, formed in dye-vats either by putting a yellow on a blue ground, or a blue on the yellow ground, or by mixing the blue and yellow materials, and dyeing with them as with a simple colour. The common and most permanent green is given to woollen cloth in the following manner. The cloth, being first dyed blue in the indigo vat (see INDIGO), is then well scoured, and afterwards dyed in a bath of weld or any other yellow dye with alun and tartar, as in the mode of dyeing of simple yellows, except that the yellow materials are used in greater quantity than the yellow alone of equal body would require. Very deep greens are made to acquire a slight brown or kind of burnish by adding to the bath small quantities of log-wood and sulphat of iron. As for silks, they are first strongly alumed, then dyed yellow with weld, and afterwards finished in the indigo vat. Silk, cotton, and linen are dyed green in the same general mode, but with considerable

variations in the different processes. The most beautiful green hitherto known, and which perfectly well resists the action of light and air, is given by the combination of Prussian blue and yellow, but this colour is destroyed by soap and alkalis. To cotton this colour is given, by first dyeing it olive with weld, or any other yellow dye, and a compound mordant of alum and iron, and then raising the green by prussiat of potash. (See PRUSSIAN blue.) Berthollet observes, that in the process for this purpose there seems to be a mutual distribution of the mordants and colours, the Prussian colour taking the iron and becoming blue, whilst the alum and weld remaining in the olive form a fast yellow, and unite with the blue into a fine green. The only simple green in common use is that of the carbonated oxyd of copper precipitated from verdigris by an alkali. A solution of verdigris is made in vinegar, and a few hours before dyeing a solution of as much pearlsh as verdigris is added to it, the mixture is heated, and the cotton, previously alumed, is passed through this bath. The colour then given is a soft apple-green. Aikin's Dict.

The dyers make divers shades, or casts of green, as *light green*, *yellow green*, *grass green*, *laurel green*, *sea green*, *dark green*, *parrot green*, and *alden green*.

GREEN, *Brunswick*, is a pigment used by some of the German artists, which they prepare by adding to the saturated solution of one part of muriated ammonia in cold water, three parts of copper clippings; and by covering the glass vessel that contains it with gauze so as to keep out the dust, and placing it in a warm situation, so that the moisture may evaporate, which purpose will be effected in a few days. The muriat of ammonia soon begins to be decomposed by the copper, which is corroded and converted into a green oxyd. When the whole is evaporated to dryness, let it be digested in two or three successive portions of spirit of wine, as long as any green oxyd is taken up; then add the solutions together and expel the liquor by a gentle heat, the residue is a pure dark green sub-muriat of copper, known in the shops by the name of refined Brunswick green.

GREEN, *Mountain*, or *Hungary green*, is a sort of greenish powder found in little grains, like sand, among the mountains of Kernaufen in Hungary, and those of Moldavia. Though some hold, that this mountain green is factitious, and the same with that the ancients called *lapis aris*, prepared by casting water, or rather wine, on copper red-hot from the furnace, and catching the fumes thereof on copper plates laid over for that purpose: or by dissolving copper-plates in wine, much as in making verdigris. The painters make use of this colour for *grass green*. It is sometimes counterfeited by grinding verdigris with emuls.

GREEN, *Calined*, and *distilled green*. See VERDIGRIS.

GREEN, *Prussian*. See the process for making PRUSSIAN blue.

GREEN, *Sap*. See colours from FERTES, BUCKLEORN, and SARDIAN.

GREEN, *Saxon*, an extremely beautiful green colour, so called because the blue part is given by the Saxon blue or sulphat of indigo; the process of dyeing which is this; the cloth or silk is first to be dyed a Saxon blue, in the following manner. Having ground nine parts of indigo with twenty of red arsenic into a fine powder, add forty-eight parts of strong spirit of vinel; which mixture swells, grows hot, and emits a sulphureous smell. After standing in a moderate warmth of twenty-four hours, pour off the liquid part, which will be of an extremely deep blue. A small quantity of this liquor, drop'd into hot water, instantly spreads, tinges it of a fine light blue, and fits it for dyeing

the prepared wool, cloth, or silk: and by increasing or diminishing the proportion of the blue composition, the colour may be rendered deeper or lighter. Thus, Dr. Lewis says, is the method used for preparing the blue composition by the dyers of Norwich, who purchased this secret from Saxony.

The cloth or silk, thus dyed blue, is next alumed, and then dipped in the yellow decoction of weld or fustic, and the desired colour will be obtained.

Fustic is commonly preferred as the yellow material, because it is less liable to be altered by the adhering acid of the sulphat of indigo than weld or the other yellows. To correct this effect of the acid, and enable quercitron to equal the fustic in this respect, (whilst its natural colour much exceeds it,) Dr. Bancroft advises, after the cloth has received the blue, to mix chalk with the alum mordant, in order to neutralize the adhering acid, before the yellow is given.

Or the subject may be dyed green at one operation, by boiling it for a little time in a mixture of the blue and yellow liquors. For this purpose the cloth is first alumed and well rinsed; and the cloth is then dyed in a strong decoction of fustic, to which, when cooled to a blood heat, is added sulphat of indigo. Dr. Bancroft recommends for dyeing a beautiful Saxon green, the following expeditious process, by using the compound alum and tin mordant; put into the boiler six or eight pounds of quercitron bark to every one hundred pounds of cloth; boil with a sufficient quantity of water; then add six pounds of the mario-sulphat of tin, (in preference to the nitro-muriat,) and four pounds of alum: when these have boiled five or six minutes, lower the heat with cold water to blood-warm, after which, add as much sulphat of indigo as may be thought necessary for the intended depth of colour, and then dye the cloth in this bath with proper care. Aikin's Dict.

By combining any blue and yellow dyes, in different proportions, all the shades of green may be produced, from the bluish green of the cabbage-leaf to the greenish-yellow of the olive.

**GREENS**, in *Agriculture*, a term provincially signifying grass-land, or such as is in the state of turf.

**GREENS**, in *Geography*, a county of America, in New York, taken from Ulster and Albany counties, bounded on the N. by Albany and Schoharie, E. by the river Hudson, S. by the county of Ulster, and W. by the county of Delaware; 30 miles in length from E. to W., and from 12 to 20 in breadth. The number of its inhabitants is 15,870, and its chief town is Kaatskill.—Also, a county of Pennsylvania, bounded N. by Washington, S. and W. by Virginia, E. by Monongahela river; 33 miles long, and 18 broad. The number of its inhabitants is 8605.—Also, a county of Kentucky, extending from Ohio river on the N. to Tennessee state on the S., and bordering W. on the Mississippi river, and E. upon Hardin and Jefferson counties. The number of its inhabitants is 6025, of whom 816 are slaves.—Also, a county of N. Carolina, in the district of Newbern, containing 4218 inhabitants, of whom 1496 are slaves.—Also, a post-town in Kennebeck county, and state of Maine, situated on the E. side of Androscoggin river, 164 miles N. E. from Boston; containing 933 inhabitants.—Also, a post-town in Franklin county, Pennsylvania, situated near the Conegocheague creek; 156 miles W. by S. from Philadelphia; containing about 80 houses, 2 German churches, and a Presbyterian church, and 884 inhabitants.—Also, a township in Franklin county, and also a township in Washington county, in the same state.—Also, a navigable river of Kentucky, which rises in Mercer county, has a gentle current, generally in a W. direction, and is navigable nearly

150 miles: at its confluence with the Ohio it is upwards of 200 yards wide.—Also, a small river which rises in the town of Marlborough, in Vermont, and falls into Connecticut river, above Deersfield, in Massachusetts.—Also, a river of New Brunswick, which runs into the St. John. N. lat. 47° 20'. W. long. 67° 58'.—Also, a river of Canada, which runs into the river St. Lawrence, 106 miles below Quebec.

**GREEN Bank**, one of the banks near the island of Newfoundland; 129 miles long, and 48 wide. N. lat. 45° 30'. to 46° 50'. W. long. 53° 30' to 53° 50'.

**GREEN Bay**, a bay on the W. side of lake Michigan, about 90 miles long, and 15, 20, or 30 broad in different parts, lying nearly from N. E. to S. W. At its entrance is a string of islands extending N. to S., called the "Grand Traverse;" these are about 30 miles in length, and serve to facilitate the passage of canoes, as they afford them a shelter from the winds. The communication between lake Michigan and the Green bay is sufficiently deep for a vessel of 60 tons, with a proportionable breadth; the land adjoining to the bottom of the bay is very fertile, the country generally level, and the views of it agreeable and extensive. The inhabitants of its coasts call this bay the Menomie bay. N. lat. 45° W. long. 87° 58'.—Also, a bay on the E. coast of the island of Antigua, S. from Green island.

**GREEN Briar**, a large and fertile county of Virginia, surrounded by Bath, Randolph, Harrison, Kanaway, Botetourt, and Montgomery counties; about one hundred miles long and 45 broad: containing 3894 free inhabitants, and 271 slaves. The chief town is Lewisburg; 103 miles W. of Staunton.—Also, a river of Virginia, which pursuing a S. W. course, runs into the eastern side of the great Kanaway. N. lat. 37° 57'. W. long. 80° 58'.

**GREEN Bug**, in *Agriculture*, the name of a small insect, which is often found destructive to different plants in both fields and gardens. It also frequently proves destructive to hop crops. It is very difficult to destroy it in many cases.

**GREEN Cheese**, in *Rural Economy*, the name of that sort of cheese which is prepared with some kind of green vegetable juice, as that of sage and other similar plants.

**GREEN COPPERAS**, See **COPPERAS**, and **Sulphat of Iron**.

**GREEN Creek**, in *Geography*, a river of Pennsylvania, which runs into the Susquehanna. N. lat. 40° 58'. W. long. 76° 30'.

**GREEN Crops**, in *Agriculture*, that sort which is formed of some kind of green vegetable; such as that of some sort of artificial grass, the turnip, cabbage, tare, rape, &c. which are so termed in contradistinction to those of the grain description. The introduction of crops of this nature between those of the grain kind, has constituted one of the most important improvements in modern agriculture. By this means, land has not only been prevented from being exhausted and worn out, but brought into the most proper condition for the growth of grain, without undergoing the injurious process of naked or summer fallowing. It has likewise had the effect of greatly increasing the number, and improving the quantity of all sorts of live stock, in consequence of their having more abundant supplies of food, and these at the same time of better qualities. There can therefore be no doubt of the great advantage of these crops, which should of course be grown as extensively as possible by the farmer, as by them he may be enabled to support much larger stocks of cattle and sheep than could otherwise be the case, and at the same time raise much larger quantities of good manure. See **MANURE**. Besides this, great advantage might, in different instances of cattle-farms of the breeding kind, be de-



rived from the more extensive cultivation of such green crops as the winter support of the stock.

And crops of this nature have likewise been found of extensive utility in the feeding of milch-cows in winter dairying, as is fully shewn in the various trials made by J. C. Curwen, esq. in a northern district of the kingdom, in the view of supplying the poor of a large town with milk. The value of which crops in this sort of application, on the supposition of their being sold to the cow-keeper, and the expenses of their cultivation, are stated in the following manner.

*Green Crops.*

Twenty-two acres of green crop, at 10 <i>l.</i> } per acre	£. s. d. 220 0 0
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*Expences of raising and cleaning.*

Four acres of cabbages, } at 12 <i>l.</i> per acre	48 0 0
Two acres of Swedish tur- } nips, at 5 <i>l.</i> per acre	10 0 0
Six acres of common red } turnips, at 4 <i>l.</i> per acre	24 0 0
One acre of Kahlrabi	5 0 0
Nine acres of rape or cole, } at 3 <i>l.</i> 10 <i>s.</i> per acre	31 10 0
	118 10 0

Gain on crops £. 101 10 0

It is considered that the improvement of the land, and the value of the succeeding crops, are fully adequate to the rent and taxes.

This statement shews in the most clear point of view the vast benefit of this kind of crops even in this sort of application, and that they should not be disregarded by those engaged in the business of husbandry. But in some other modes of application they will be found far more important and beneficial.

By some they have also been considered as of great utility when turned into the soil by way of a manure, though others are wholly of a different opinion; probably in consequence of the trials having been made in very opposite descriptions of soils, and under very different circumstances of them. It is extremely probable, likewise, that the advantage of this practice will be much greater where the crops are turned in during the summer months than in other cases, in consequence of their running more quickly into the putrefactive state. It has been advised, that whatever may be the nature of the crops, they should be ploughed under by means of a skim-coulter plough, as constituting the only means of turning them in, in so complete a manner as wholly to conceal them. And that, in case of sowing the land with broad cast turnips, the work should be performed at least three weeks before the seed is put into the soil, and that it should be afterwards only very slightly harrowed in. See *Turning in Green Crops.*

*Green Earth*, in *Mineralogy*, Baldsee, Sauss.; *Chlorite taldoée*, Brong.; *Argilla veroneseis*, Wern.; *Grünerde*, Wern.; *Talc chlorite zoographique*, Hall; *Verd. di Verona*, *Verde di Brentonico*, Ital.; Veronese earth, an earthy substance belonging to the argillaceous genus. Its colour is indicated by its name, but there are several shades of it, the principal of which are verdigris, and celadon green, passing sometimes into leek and mountain green, frequently with an admixture of grey; it has also been observed of a more or less pure olive green.

It occurs massive and disseminated, in rounded and angular fragments, and in globular concretions; likewise in grains mixed with sand, and as coating on agate balls, in the hollows of amygdaloid, (toad-stone,) &c. Internally it is dull, but on the rifts a fat-like lustre is sometimes observable.

Fracture fine-earthly, or more or less flat conchoidal, approaching to slaty. Divisible into indeterminately angular, blunt-edged, opaque fragments.

It feels rather greasy, is always more or less soft, mild, and easily frangible; streak rather shining; adhesion to the tongue inconsiderable. Specific gravity about 2½.

The chemical characters of green-earth, derived from Klaproth's analysis of three varieties, viz. those from Monte Baldo, in the Veronese, from Cyprus, and from East Prussia, are the following:

The green-earth from Monte Baldo, when heated to redness, loses six per cent. of its weight, while its hardness is considerably increased. The fragments thus subjected to the fire become externally of a yellowish-brown colour, internally greyish-black and glistening. That of Cyprus, after ignition, loses eight parts of its weight; and its colour is converted into dirty brownish yellow. Exposed to the fire of the porcelain furnace in the charcoal crucible, it fuses to a somewhat porous greenish glass, externally of a dirty-green colour, internally of that of emerald; in the clay crucible it is converted into a greenish-grey slag. The green-earth of New East Prussia, when freed from the admixed sand by elutriation, and ignited, changes its green colour into light leather-brown; the conglomerated particles are converted into a hard mass, and thus lose nine per cent. of their weight. The acids do not act upon green-earth, and they leave its colour unaltered.

The results of the analyses of the above three varieties were:

Green-earth of Monte Baldo, in the Veronese.	Green-earth of Cyprus.
Silica - - - 53	51.50
Oxyd of iron - - 28	20.50
Magnesia - - - 2	1.50
Kali - - - 10	18.
Water - - - 6	8.
Loss - - - 1	.50
Klapr. Beitr. vol. 4. 100	ibid. 100

*Green-earth of New East Prussia.*

Silica - - - - -	51.
Alumina - - - - -	12.
Magnesia - - - - -	3.50
Lime - - - - -	2.50
Oxyd of iron - - - -	17.
Natron, with a trace of kali - - -	4.50
Water - - - - -	9.
Loss - - - - -	50
	ibid. 100

The Prussian green-earth, by thus differing from the two others, particularly with regard to the alumina as a constituent part, appears to approach the nature of chlorite.

Green-earth occurs principally in amygdaloid, also as incrustation on the nodules of zeolite, &c. contained in the vacancies; sometimes as coating the sides of these vacancies, which are often partly filled with the earth. It is also, though less frequently, found in porphyry and basalt, as nodules in the newer sandstone, and even in the rocks belonging to the new Retz-trap-formation, such as at Aichau in

in Bohemia, where calcareous tuff is seen alternating with narrow layers of a conglomerate, made up of grains of calcareous spar, and blunt-edged fragments of the tuff to which the green earth serves as the cementing substance. But in the same place green-earth forms a strata-layer of about a foot in thickness, whose base consists of wacke-like clay and calcareous tuff; the roof of indurated marl. The green-earth of New East Prussia, consisting of earthy particles mixed with a coarse sand, forms a considerable bed in the neighbourhood of the river Memel, between Lössbina and Salloweje.

Among the *localities*, besides those of Monte Baldo in the Veronese, Cyprus, Prussia, and Bohemia, already pointed out, the following may be mentioned: Altenburg and Planitz, in Saxony; Oberstein, in the Palatinate; Kovacli, in Hungary; Pontaudemer, in Normandy; Scotland, Iceland, the Ferroe-islands, and wherever true amygdaloid occurs.

This earth is *used* as a pigment, particularly for water-colour painting; and, being very durable, and not too expensive, also for house painting, &c.

The green-earth of Cyprus, according to Mariti, is sold at  $4\frac{1}{2}$  piasters for a measure of 100 cakes. It is carried from the pit in large baskets made of the palm-tree; three of these baskets generally contain the above mentioned quantity. A great deal was exported to Holland; often by way of ballast.

That of Bohemia, above mentioned, is sold, according as its colour is deeper and its grain finer, from two to four florins the cwt. Part of it is also burnt there in small kilns, and sold as a red pigment.

By the Italians green earth is called Verde di Brentonico, from the vicinity of Monte Bolca to a place of that name.

GREEN FALLOW, in *Agriculture*, a term often applied to such arable land as is rendered clean and free from weeds, by means of green crops, without having recourse to the process of naked or summer fallowing. This constitutes one of the numerous improvements in modern husbandry. See FALLOWING of Land.

GREEN Finch, in *Ornithology*. See LOXIA Chloris. See also TANAGRA Gyrolis, and FRINGILLA butyracea.

GREEN Fish. See COD-FISHERY.

GREEN Food, in *Agriculture*, that sort of food which is employed in its green or succulent condition, in the feeding, fostering, and supporting of various kinds of live stock. This is a sort of food that has, within these late years, been much more extensively employed than was formerly the case; yet its advantages are probably in general not so fully understood as they ought to be. Its importance and utility will, however, soon appear by the making of a few experiments in a proper manner.

GREEN Glass. See GLASS.

GREEN Heav, or green-buc, in our *Old Writers*, the same with *wet* in forests, &c.

GREEN Hides, are those not yet tanned, or dressed, but such as are taken off from the carcasses. See HIDE and CURRING.

GREEN Iron Earth. See IRON.

GREEN Island, in *Geography*, a small island among the Philippines, near the S. coast of the island of St. Lucan. N. lat. 13° 30'. E. long. 121° 2'.—Also, a small island in the East Indian sea. S. lat. 6° 5'. E. long. 123° 30'. Also, one of the smaller Balama islands. N. lat. 21° 38'. W. long. 57'.—Also, one of the lesser Virgin islands, called likewise "Serpent island," situated near the E. end of Porto Rico.—Also, a low woody island near the N. E. coast of New Holland; 12 miles E. N. E. of Cape Grafton. S. lat. 16° 48'. W. long. 214° 5'.—Also, an island in Hud-

son's bay. N. lat. 61° 2'. W. long. 72° 40'.—Also, an island in the Atlantic, near the coast of Main. N. lat. 44° 41'. W. long. 67° 23'.—Also, a small island near the E. coast of Antigua. N. lat. 17° 13'. W. long. 61° 21'.—Also, a small island in the West Indies, about a mile N. E. from the island of St. Thomas.

GREEN Islands, a cluster of small islands in the Pacific ocean, discovered by Schouten and Le Maire. N. lat. 4° 53'. E. long. 154° 50'.—Also, a range of small islands in that part of the East Indian sea, called the "sea of Mindero," near the E. coast of Palawan. N. lat. 9° 33'. E. long. 119° 6'.—Also, a group of low islands in Prince William's sound, situated within the S. W. channel, between Montagu's island and Knight's island. Capt. Cook, in his third voyage, 1778, observed that they were entirely free from snow, and covered with wood and verdure, and therefore called them by this name. The channel between Montagu island and the Green islands is between two and three leagues broad, and from 34 to 17 fathoms deep.

GREEN Island Harbour, a bay on the W. coast of the island of Jamaica. N. lat. 18° 24'. W. long. 78° 17'.

GREEN KEY, or PUERCO, a small island among the Bahamas. N. lat. 23° 56'. W. long. 77° 50'.

GREEN Lead Ore. See LEAD.

GREEN Mountains, in *Geography*, a range of mountains in America, extending N. N. E. to S. S. W. and dividing the waters which run easterly into Connecticut river from those which fall westerly into lake Champlain, lake George, and Hudson's river. The ascent from the east to the top of the Green mountain in Vermont is much more easy than that from the west, till you get to Onion river, where the mountain terminates. The vegetables that naturally grow on this mountain are hemlock, pine, spruce, and other evergreens, which always exhibit a green appearance; and hence its name. The chain of mountains extends through Massachusetts and Connecticut, and terminates in New Haven. Kellington peak, the highest of these mountains, is about 3454 feet above the level of the ocean. Morse.

GREEN Point, a cape on the W. coast of Africa. S. lat. 11° 53'.—Also, a cape on the coast of West Florida, in Pensacola bay. N. lat. 30° 31'. W. long. 87° 4'.

GREEN Sausc, in *Agriculture*, a term sometimes provincially applied to the common sorrel.

GREEN Scouring, a disease to which sheep, calves, and cattle are frequently exposed, and which is with difficulty removed. See SCOUR.

GREEN-Shank, in *Ornithology*, the SCOLOPAX glottis of Linnaeus; which see.

GREEN Sickness. See CHLOROSIS.

GREEN Side, in *Agriculture*, a term often provincially applied to grass-land, turf, or sward.

GREEN Silver, the name of an ancient custom within the manor of Writtle, in the county of Essex; which is, that every tenant, whose fore-door opens to Greenbury, shall pay a half-penny yearly to the lord, by the name of *green silver*. Blount.

GREEN Sed, in *Agriculture*, a term provincially applied to grass-ground, turf, or sward.

GREEN-Stone, in *Mineralogy*, according to the more general acceptation of the word, is a rock composed of hornblende and feldspar, and belonging to what is termed by Werner the trap formation. (See TRAP.) Mica and quartz are likewise seen to constitute ingredients of this rock, but they are not considered as essentially belonging to it. The *Groensten* of Cronstedt is, upon the whole, the same as our green-stone; but in some cases too great latitude has been given to that name.

## GREEN-STONE.

This rock, with a view to the periods of its formation, is divided into primitive, transition, and fletz green-stone.

The *primitive green-stone* is generally distinguishable from the others by its highly crystalline structure. The hornblende, in which a tendency to crystallization is almost always observable, generally constitutes the predominant ingredient; but sometimes this is only apparently so, the feldspar being not seldom stained by it in such a manner, that it bears the greatest resemblance to small laminae of hornblende. In this case the blow-pipe discovers the illusion by melting the hornblende; when the feldspar recovers its usual whitish colour, and is converted into a white glass.

Werner subdivides primitive green-stone into four varieties: 1. *Common green-stone*, in which the two ingredients, mixed in different proportions, form a granular mass. 2. *Porphyritic green-stone*, being the common variety, including large crystals of feldspar. 3. *Green-stone porphyry*, in which "the granular basis, which is with difficulty distinguishable, includes crystals of feldspar;" and 4. *Green porphyry*, in which "the granular nature of the basis is no longer visible to the naked eye; it appears uniform and simple; has a blackish green or pistachio green colour, and includes crystals of compact feldspar." (Jameſon.) To these are to be referred the porſido nero, and porſido verde antico of Italian antiquaries, of which we ſhall ſay more hereafter. The third and fourth of theſe varieties might, we think, be ſafely united; at leaſt the definition given of them does not indicate any difference, except in the ſhade of green.

This old green-stone appears ſometimes ſtratiſied. Gneifs is the rock in which the different varieties firſt appear; the next rock in which they occur is mica-ſlate, but the beds of green-ſtone in either of them are ſcanty and inconfiderable; they are obſerved more numerous and of greater extent in clay ſlate in Scotland. According to Mr. Jameſon, the clay-ſlate and mica-ſlate, that form a great portion of the country extending from Loch Lomond, by Callander, Comrie, and Dunkeld, contain numerous beds of green-ſtone; and there, we are informed by this geognoſian, as in all other countries, the clay ſlate contains more numerous and larger beds than the mica ſlate.

There is a vaſt number of varieties of primitive green-ſtone in Bohemia; thus it is found in the Saatz diſtrict of that country, where it reſts chiefly on gneifs. It occurs there alſo with quartz as a conſtituent part. The varieties mentioned by Reuſs, as being found there within a narrow compaſs, are, 1. A ſmall grained mixture of velvet black hornblende, which exhibits a tendency to a prismatic crystalline form, with yellowiſh white feldſpar, and greyiſh-white and ſmoke grey quartz. The hornblende is the predominant part; the quartz is here and there entirely wanting; the mixture pretty uniformly granular. 2. A variety in which the hornblende is ſeen in groups, diſtinct from thoſe of the feldſpar and quartz; ſo that the whole forms an aſſemblage of black and yellowiſh-white ſpots. 3. A variety in which the hornblende is ſo prevalent, that feldſpar and quartz can with difficulty be diſtinguiſhed by the magnifying glaſs, which diſcovers theſe ingredients collected into ſmall ſpots and ſtripes: it contains alſo here and there ſome ſcales of mica. 4. Var. in which the hornblende is ſeen partly maſſive, in ſpots, ſtripes uniformly blended with the feldſpar and quartz; partly in ſmall circular crystals that are divergingly aggregated, or croſs each other in all directions; feldſpar tile and browniſh-red; quartz only here and there in ſmoke grey grains. 5. Var. in which the hornblende ſhows a ſtrong tendency to crystallization, and is much accumulated in ſome places; though, generally ſpeaking, its proportion to the mixture of yellowiſh-white and reddiſh-grey feldſpar and greyiſh-

white quartz, is but ſmall: it contains larger and more numerous ſcales of ſilvery and yellowiſh-white mica. 6. Var. in which the texture becomes more thick-flaky; the ſmoke-grey quartz becomes predominant, the yellowiſh-white feldſpar diſappears almoſt entirely, and the hornblende is only thickly diſſeminated. 7. Var. in which the yellowiſh-white and reddiſh-grey feldſpar predominates over the hornblende, which is ſeen partly maſſive and in fine granular concretions, partly in inſulated and diſperſed minute ſix-ſided prisms, imbedded in the feldſpar; while the quartz is entirely wanting. It is remarkable that in this diſtrict the primitive green-ſtone is ſeen, by ſlow gradation, to paſs over into perfect gneifs. The more it approaches the latter, the more the granular texture becomes indiſtinct; the rock adopts a thick ſlaty texture, the hornblende is ſeen more and more to diminiſh, while the mica increaſes both in quantity and ſize, until perfect gneifs ſtands conſeſſed as the conſtituent rock.

This rock is common alſo in many other parts of Europe; but the accounts we poſſeſs of the green-ſtone of ſeveral countries is too imperfect to enable us to determine how much of it may be conſidered as primitive.

The *transition green-stone* is not eaily diſcriminated in hand ſpecimens. It is characterized by Mr. Jameſon as being "a fine granular mixture of hornblende and feldſpar; and ſometimes the mixture is ſo intimate, that the conſtituent parts are not to be diſtinguiſhed. Quartz ſometimes traverses it in the form of veins, or is diſſeminated through it; a character which diſtinguiſhes it from fletz green-ſtone, which rarely contains quartz. Sometimes it occurs in globular diſtinct concretions, and theſe again conſiſt of curved lamellar concretions, forming the globular rock (Kugelfels) of Voigtland. Sometimes it is penetrated with reddiſh brown oxyd of iron, which, combined with the dark-brown hornblende, gives the rock a liver-brown colour; hence it is denominated in Voigtland, where it occurs, Leber-fels, or liver rock. Beds of it occur in the upper part of Dumfriſhire, in the Hartz, Bohemia, &c."

*Fletz-green-stone.* Prof. Jameſon, in his "Mineralogical Deſcription of Dumfriſhire," has given a ſhort account of the occurrence of green-ſtone in the independent coal-formation; and Mr. Flürl has diſcovered beds of amygdaloid in the firſt or oldeſt fletz-lime-ſtone; whence the former author conſiders himſelf entitled to introduce what he terms the *fletz-trap*, which is diſtinct from the ſtill newer formation called the *newſt fletz-trap* by Werner. In the independent coal formation it occurs in beds from one foot to many fathoms in thickneſs; it contains imbedded olivine and augite, and is traversed by numerous veins of calc-ſpar; it often alſo contains druſy cavities, which are lined with calc-ſpar, quartz, barytes, cubicite and premitte; and the cavities are ſometimes filled with water.

The green-ſtone of Werner's *newſt fletz-trap formation*, is, upon the whole, diſtinguiſhable from the older formation, by its ſtructure being of a leſs crystalline appearance, and by its diſtinct concretions approaching more to the coarſe granular. "Its colour uſually inclines more or leſs to green. Certain varieties are reddiſh, and theſe are denominated primitive green-ſtone. When freſh and rather large granular, it uſually exhibits a ſimple ſtructure; when, on the contrary, it is diſintegrated, and smaller granular, it occurs in globular, and theſe again in curved lamellar diſtinct concretions. Certain varieties approach to wacke, and theſe are uſually vicular, and form a kind of amygdaloid. It is ſometimes very ſtratiſied, and frequently occurs in veins." Jameſon.

The *uſe* to which the common green-ſtone is applied are

net and fold. As it frequently contains a considerable portion of iron, and is sufficiently fusible, it serves for a flux in the iron work in Saolaud. Of the porphyritic varieties of the primitive green-stone used for ornament, the following deserve to be mentioned:

*Antique black porphyry* (porfido nero antico). There are two or three varieties differing, with regard to the intensity of the colour, from greenish-black to velvet-black; and likewise with regard to the size of the whitish feldspar-crystals: in one of them the crystals are very small, and this is more frequently seen among the remains of antiquity than the other.

Mr. Grassmaner, in his mineralogy of Alsace, mentions a black porphyry as occurring at Framont; and also as rounded blocks in the river Ill.

In the black *Corsican* porphyry, the feldspar-crystals have a slight tint of green, like those of the antique green porphyry. Ferber makes mention of a *Sardinian* black porphyry, and Saussure of one found in the neighbourhood of *Genova*, which, besides small prismatic crystals of feldspar, includes rounded grains of transparent colourless quartz. The latter addition is likewise observed in a variety of a blackish *Siberian* porphyry, which is sometimes wrought for ornamental purposes.

*Antique green porphyry* (porfido verde antico). This is the *ophites* of the ancients; a name derived from some supposed resemblance of this rock, when polished, to the skin of a serpent; whence, in modern times, antiquaries have referred the porphyry in question to the magnesian stone called serpentine, a mixture of which, with primitive limestone, constitutes the rock called *verde antico*. When once considered as the same with the real serpentine, the name *verde antico*, of course, also was equally applied to the green porphyry; a circumstance which has been productive of great confusion. There are now but few monuments of ancient art executed in this porphyry to be met with.

There are some varieties of green porphyry, much resembling the antique, still found in several parts of Europe. There is a quarry of it on Monte Viso, in Piedmont; which, besides the feldspar, contains reddish grains, supposed to be garnets.

The *green Sardinian porphyry*, found in the district of Niotto, in Corsica, has a deep bottle-green base, and fine white feldspar-crystals; another, which contains some dark red garnets, occurs in the district of Golo in the same island.

Saussure describes the *green porphyry of Geneva*, resembling the black porphyry above-mentioned, in the figure and colour of the feldspar and quartz, but differing in its base, which is light green and, in fragments, translucent at the edges. Both this and the black take an excellent polish.

The *green porphyry of the Vesiges* has a dark green base, and contains numerous middle-sized feldspar-crystals of a pale green colour. It is found at La Chevretrey, on the heights of Fresse en Comte, and made use of for ornamental purposes. In another variety, found not far from this quarry, the feldspar-crystals are so pressed against each other, that they are ill-formed, and conceal almost the whole of the base. They are manufactured into tops for tables, chimney-pieces, &c. and sometimes pass by the improper name of green granite.

There is abundance of the green porphyry in the Pyrenees, where it is known by the old appellation of *ophite*.

*Green-stone slate*, a compound rock, which may be considered as a variety of the preceding, from which it differs in having a distinct slaty structure; the feldspar, moreover, being generally more abundant than the hornblende. It

ranks with the primitive trap, but, not occurring in rocks older than clay-slate, is considered as the newest of the last class of the trap formation. It occurs in considerable beds, and in Sweden whole mountains are said to consist of it. Several mining districts are situated in this rock, such as those of Gerdsdorf, in Saxony, of Radollstadt, in Silesia, and of Adelfors, in Sweden.

*GREEN Sward*, in *Agriculture*, a name applied to the grass, turf, or sward, by which land is covered while in the state of pasture or under the feythe. Such land as has been long in this state, is mostly covered with a close compact sward; while in the contrary case, it is mostly light, open, and thin. See SWARD.

*GREEN Turtle Bay*, in *Geography*, a small island among the Bahamas. N. lat. 26 40. W. long. 77° 59'.

*GREEN Wax* is used where estreats are delivered to the sheriffs out of the exchequer, under the seal of that court, made in green wax, to be levied in the several counties.

*GREEN Weed*. See BROOM.

*GREEN Winter*. See WINTER Gr.cn.

*GREENÆ*, in *Geography*, a town of Denmark, in North Jutland; 28 miles N. E. of Aarhuus.

*GREENBURGH*, a township of West Chester, in the state of New York, containing 1581 inhabitants.

*GREENBUSH*, a township of Rensselaer county, New York, containing 3472 inhabitants.

*GREENCLOTH*, a board, or court of justice, held in the compting-house of the king's household, for the taking cognizance of all matters of government and justice within the king's court royal; and for correcting all the servants therein, that shall any way offend.

To this court also belonged the authority of maintaining the peace for twelve miles round the king's court, wherever it shall be, excepting at London.

The judge of this court was the lord steward, assisted by the treasurer, comptroller, cofferer, clerks of the greencloth, &c. It took its name, *greencloth*, from a greencloth spread over the board where they sat, whereon were the arms of the compting-house. The clerks of this court were officers who attended there, and had business assigned them by the board. All bills of comptrolments, relating to the office, were summed up, and allowed by the clerks comptrollers, and audited by the clerks of the greencloth. They also appointed the king's, queen's and household's diet, and kept all records, ledgers, and papers, relating thereto; made up bills, parcels, and debentures for salaries, &c. and provisions and necessaries for the officers of the pantry, buttery, cellar, &c. They also waited upon foreign princes, when entertained by his majesty. This court has been abolished.

*GREENE, MAURICE*, Dr. in *Biography*, was the son of the Rev. Thomas Greene, vicar of St. Olave Jewry, in London, and nephew of John Greene, serjeant at law. He was brought up in the choir of St. Paul, and when his voice broke was bound apprentice to Brind, the organist of that cathedral. He was early noticed as an elegant organ player and composer for the church, and obtained the place of organist of St. Dunstan in the West, before he was twenty years of age. In 1717, on the death of Daniel Purcell, he was likewise elected organist of St. Andrew's, Holborn; but the next year, his master Brind dying, Greene was appointed his successor by the dean and chapter of St. Paul's; upon which event, he quitted both the places he had previously obtained. In 1726, on the death of Dr. Crofts, he was appointed organist and composer to the Chapel Royal; and on the death of Eccles, 1735, master of his majesty's band. In 1730, he obtained the

the degree of doctor in music at Cambridge, and was appointed public music professor in the same university, in the room of Dr. Tudway. Greene was an intelligent man, a constant attendant at the opera, and an acute observer of the improvements in composition and performance, which Handel and the Italian singers employed in his dramas, had introduced into this country. His melody is therefore more elegant, and harmony more pure, than those of his predecessors, though less nervous and original. Greene had the misfortune to live in the age and neighbourhood of a musical giant, with whom he was utterly unable to contend, but by cabal and alliance with his enemies. Handel was but too prone to treat inferior artists with contempt; what provocation he had received from Greene, after their first acquaintance, when our countryman had a due sense of his great powers, we know not; but for many years of his life, he never spoke of him without some injurious epithet. Greene's figure was below the common size, and he had the misfortune to be very much deformed; yet his address and exterior manners were those of a man of the world, mild, attentive, and well-bred. History has little to do with the infirmities of artists; who being *men*, in spite of uncommon gifts and inspirations, are subject to human frailties, which enthusiasm, praise, and the love of fame, more frequently augment than diminish.

Greene had the honour, early in life, to teach the duchess of Newcastle, which, joined to his professional merit, and the propriety of his conduct, was the foundation of his favour with the prime minister, and the notice of the first people about the court. In 1730, when the duke of Newcastle was installed chancellor of the university of Cambridge, he was appointed to set the ode, and then not only obtained his doctor's degree, but, on the death of Dr. Tudway, he was honoured with the title of professor of music in that university. As an exercise for his degree, he set Pope's ode for St. Cecilia's day; having first had interest sufficient to prevail on the author to make new arrangements in the poem to render it more fit for music, and even to add an entire new stanza, between the second and third, which had never appeared in any of the printed editions.

Greene had sense and knowledge sufficient, in his younger days, to admire and respect the abilities of the two great musical champions, Handel and Bononcini, whose disputed talents occasioned as much discord in the capital as the factions of Whig and Tory. At the same time as he was impressed with the highest reverence for Handel's great style of playing the organ, and the force of his genius for composition, he could not help listening with pleasure to Bononcini's performance on the violoncello, and to the grace and good taste of some of his opera songs; at which, perhaps, Handel took umbrage—for during these feuds, he broke off his acquaintance, and ever afterwards, regarding him as an enemy, never mentioned his name but with contempt. This treatment naturally rendered Greene a partisan on the side of Bononcini, and in 1728 he defended him, as long as he was able, from the charge of plagiarising, with respect to a cantata which had been introduced at the academy of ancient music as Bononcini's, and which was afterwards discovered to be the composition of Lotti, at Venice. See BONONCINI.

Greene's merit and connections were such, that he soon arrived at the most honourable appointments in his profession: for besides being organist of St. Paul's, in 1727, on the death of Dr. Croft, he was appointed organist and composer of the Chapel Royal; and in 1735 he succeeded Eccles

as composer to his majesty, and master of his band, in which station he set all the odes of the laureate, Colley Cibber, as long as he lived.

The compositions of Dr. Greene were very numerous, particularly for the church. Early in his career he set a *Te Deum*, and part of the *Song of Deborah*, which were never printed; but the anthems and services which he produced for St. Paul's and the King's Chapel, he collected and published in two vols. folio; and of these the merit is so various as to leave them open to much discrimination and fair criticism. Among the faults to be ascribed to this composer, none are so flagrant as the light divisions in which his solo anthems abound, and the repetition of passages a note higher or a note lower in what the Italians call *roscia*, which are always dull, tiresome, and indications of a feeble fancy. The opening of his second solo anthem, vol. i. p. 26, is very solemn and pathetic, and the organ-part judicious and pleasing; but, page 45, *Santa Rosalia* tells her beads six times, while one very short passage is singing. "Lord how long wilt thou be angry," *alla Palestrina*, for five voices, though none of the subjects are new, seems to us the best full anthem of his composition. The style is clear, the answers are regular, and the modulation such as discovers a familiar acquaintance with the best ancient writers for the church. Of the full anthem: "O sing unto the Lord," for five voices, the fugue in the first movement is well worked, and has a good effect in performance; but the rest of the anthem is not equal in its subjects, or their treatment. "Lord how are they increased that trouble me," seems one of the most pleasing of Dr. Greene's solo anthems. The last anthem in the first volume, for two voices, has many pleasing passages, and rather more variety of subject than most of the others.

The first movement in the second volume seems calculated to display, in the performers, the power of making a shake upon short notice. A shake, judiciously applied, is a brilliant embellishment in a singer; but when lavished, improperly, is pert and unmeaning; nor is it ever more so than upon the first note of a movement. There are no fewer than seventeen or eighteen shakes distributed among the performers in the course of one page, which are more than a modern opera singer of judgment, taste, and expression, would use in a month, were his shake ever so good; the rest of the anthem is on common subjects, which are commonly treated.

The two-part anthem, "Thou, O God, art praised," has repeatedly a passage on the word *praised*, which has to our ear the disagreeable effect of two fifths; and there is a point at "unto thee shall my vow be performed," for which he was manifestly obliged to the second movement of Handel's fourth organ concerto. The rest of the anthem consists of agreeable passages of the times, but nothing like originality appears in any one idea.

"The King shall rejoice," for three voices, is agreeable common-place. Perhaps that is hardly enough to say of the second movement: "O Lord grant me a long life."

"Let my complaint," a full anthem, a 5. is very solemn and solid composition.

The anthem for Christmas day has an air of cheerfulness, suitable to the occasion, which runs through the whole composition. "Hear my prayer, O God," has more merit of gravity and expression than most of the anthems in this volume. "O sing unto God," is agreeable music, but too secular in its melody, and return to the subject. "I have mercy upon me;" the two first movements of this anthem

are sober and affecting; but the second and third have too many vulgar and worn-out divisions; the last chorus, however, is more ecclesiastical, and less common in melody and modulation. The solo anthem: "Hear, O Lord," for a base voice, is grave and pathetic, on the model of Handel's best oratorio songs. The same may be said of the next, for two voices: "I will seek unto God." "O God of my righteousness," is superior in the duet movement, solo verse, and chorus, to any thing in the preceding part of this volume; this anthem rises somewhat above mediocrity. "O give thanks," is wholly built with Cor. II.'s and Handel's materials, though somewhat differently disposed; particularly page 86, where the whole harmony moves together, one note lower, three times, for a crotchet rest, to this base: E, B  $\times$  3d, E; D, A  $\times$  3d, D; C, G, C. "The Lord is my shepherd," has too many light song-passages in it, notwithstanding the white and sq are notes which give it a venerable look on paper. "O how amiable are thy dwellings," is a very agreeable anthem, though the passages were not new at the time it was composed. The movement with an organ accompaniment, in the anthem: "My soul truly waiteth," is well conducted, and not common; the rest of the anthem has merit, particularly the chorus of the last movement. "The Lord, even the most mighty God," for a base voice, is set with great gravity and propriety; few anthems, indeed, for that species of voice, are more agreeable; the points, however, in the chorus, are very common. The anthem in eight parts, *à due voci*: "How long wilt thou forget me," is very well written, *à capella*, and good music. Indeed, the first movement of this anthem manifests greater abilities than any of his productions that we have seen, who is in general very correct in his harmony; but as to invention and design, he seldom soars above mediocrity. "O Lord give thine ear unto my prayer," for two voices, is very pleasing music, particularly the first movement. The last anthem of this volume is made up of common play-house passages; the first movement is heavy and monotonous; the andante tir. some, by the repetitions of an old harpichord-lesson passage in the base; the chorus justifies Mr. Blason's censure of the author, (collected of the words of anthems) for his too long and frequent divisions; these are too vulgar and riotous for the church, and, indeed, would have no merit of novelty any where. The *Adagio*, page 151, upon which the last chorus is built, has more of the dancing minuet, or Vaux-hall song, in it, than belong to that species of gravity and dignity which befits devotion. We think we could neither play nor hear this movement in a church, without feeling ashamed of its impropriety.

There is considerable merit of various kinds in the Collection of Catches, Canons, and two-part Songs, published by Dr. Greene; the composition is clear, correct, and masterly; the melodies, for the time when they were produced, are elegant, and designs intelligent and ingenious. It was sarcastically said, during the life of this composer, that his secular music smelt of the church, and his anthems of the theatre. The truth is, he produced but little secular music. His song of "Go rise," was long in general favour, and some of his easy ballads, as "Busy, curious, thirsty thy;" "Dear Child! while thus beyond measure," &c. were the delight of ballad-mongers fifty years ago. The collection of harpichord lessons, which he published late in his life, though they discovered no great powers of invention, or hand, had its day of favour, as a boarding-school book: for being neither so elaborate as those of Handel, nor so difficult as the lessons of Scarlatti, or the *Contas* of Alcega, they gave but little trouble, either to

the master or scholar. Indeed, as all the passages are so familiar and temporary, they seem to have been occasionally produced for idle pupils at different times, with whom facility was the first recommendation.

Dr. Greene, during the last years of his life, began to collect the services and anthems of our old church composers, from the single parts used in the several cathedrals of the kingdom, in order to correct and publish them in score; a plan which he did not live to accomplish; but bequeathing his papers to Dr. Boyce, it was afterwards executed in a very splendid and ample manner. Dr. Greene died in 1755, and was succeeded, as composer to the Chapel Royal and master of his majesty's band, by his worthy pupil Dr. Boyce.

GREENE, in *Geography*, a county of Washington district in Tennessee, containing 7610 inhabitants, of whom 471 are slaves. Greenville college has been established by law in this county. (See GREENVILLE)—Also, a county in the upper district of Georgia, bounded W. by the upper part of Oconee river, E by Wilkes county, and S. by that of Washington, containing 10761 inhabitants, including 3657 slaves. The chief town is Greensborough.—Also, a county in the state of Ohio, bounded N. on the Indian ocean, S. on Ross and Warren, E on Ross and Franklin, and W. on Montgomery county. Its extent from N. to S. is 58, and from E to W. 21 miles. By the census of 1803 it contains 446 white males of 21 years and upwards.—Also, a township in Chenango county, New York, on the E. side of Chenango river, containing 655 inhabitants.

GREENFIELD, a handsome flourishing post-town in Hampshire county, Massachusetts, about 104 miles W. by N. from Boston. This township lies on the W. banks of the Connecticut river; it was incorporated in 1753, and contains 1254 inhabitants.—Also, a post-town in Saratoga county, New York, containing 3073 inhabitants.—Also, a town in Hillsborough county, New Hampshire, containing 934 inhabitants.

GREENHILL, JOHN, in *Biography*, a painter of much promise, but whose dissolute morals cut short his thread of life, at the early age of 20. He was born at Salisbury in 1649, and became a pupil of Lely, whose manner of *course* he imitated, and with much success.

GREENHOUSE, in *Gardening*, a house of shelter in a garden; contrived for preserving the more tender and curious exotic plants, which will not bear the winter's cold abroad in our climate.

*Greenhouses*, as they are now built, serve not only as conservatories, but likewise as ornaments of gardens; being usually large and beautiful structures, in form of galleries, wherein the plants are handsomely ranged in cases for the purpose.

The greenhouse is a sort of building, fronted and covered with glazed frames, destined for the purpose of preserving various sorts of exotic shrubs, &c. through the winter season: the aid of artificial heat is not here necessary, except in very intense cold weather. It is advisable, in constructing such houses, to erect flues to use occasionally, which may prove serviceable, not only in severe frosts, but also in moist foggy weather, where a moderate fire will now and then dry up the damps, which would otherwise prove pernicious to many of the tender kinds of plants.

It differs from the conservatory chiefly in this circumstance, that the plants, trees, or shrubs, are in pots or tubs, and placed upon stands, frames, or stages, during the winter, to be removed to proper situations in the open air, in the hot summer season; while in that there are beds, bor-



## GREEN-HOUSE PLANTS.

ders, and clumps, laid out in the ground plan, and made up with the best earthy materials, to the depth of three or four feet, in which the shrubs, trees, &c. are regularly planted; the whole of the roof being removed during the summer to admit fresh air, and replaced on the approach of the autumn, to remain until the following summer renders it unnecessary.

The green-houses are at present mostly contrived to stand in the pleasure-ground, near to the house, if possible. They should be upon a somewhat elevated spot, full to the south, and where the sun has access from its rising to its setting: these buildings are commonly of brick or stone, having the fronts and tops almost wholly of glass-work; and ranging lengthways east and west. They are generally constructed upon some ornamental plan. As to the general dimensions in respect to length, width, and height, they may be from ten to fifty feet, or more in length, according to the number of plants to be contained; and in width, from ten or fifteen to twenty feet; but for middling-houses, fifteen or eighteen feet is a sufficient width; and in height in the clear, nearly in proportion to the width.

The walls on the backs and ends, particularly the former, should be carried up two bricks thick; and if more than fifteen feet high, two bricks and a half thick; at one end of the back wall on the outside, it is eligible to erect a furnace, for burning fires occasionally, communicating with flues within, ranging in two or three returns along the back wall, having one flue running along the front and end walls, raised wholly above the floor of the house.

The fronts of the buildings should have as much glass as possible, and wide glass doors should be made in the middle, both for ornament and entrance, and for moving in and out the plants. It would also be convenient to have a smaller entrance door at one end: the width of the windows for the glass sashes may be five or six feet; and the piers between the sashes may be either of timber, six, eight, or ten inches wide, according to their height, or if of brick or stone-work, two feet wide at least, sloping both sides of each pier inward, that by taking off the angles, a free admission may be given to the rays of the sun. For the same reason, the bottoms of the sashes should reach within a foot of the floor of the house, and their tops almost as high as the roof; and if brick or stone piers two feet wide, shutters may be hung on the inside to fall back against each pier. The roof may be either wholly or only half glass-work, next the front; the other half slated, especially if the upright or front piers are of timber; and the shutters to cover the top glasses may be so contrived as to slide under the slated roof: where the piers are of brick or stone, it is common to have the roof entirely slated or tiled; but slating is the most ornamental for a half or whole roof; and the ceiling within should be white; which, as well as the whole inside wall, must be well plastered and white-washed, so as to render it clean and neat.

But in green-houses of modern construction, in order to have as much glass as possible in front, the piers between the sashes are commonly of timber only, from six to eight or ten inches thick, according to the height, so as to admit as great a portion of light and heat of the sun as possible, and the roofs wholly of glazed frame-work.

The green-houses for large collections of plants have sometimes two wings of smaller dimensions, added to the main buildings, at each end, in a right line, separated sometimes from it by a glass partition, with sliding sashes for communication, and the front almost wholly of glass-work, and half or whole glass roofs. Thus, by these additional wings, the houses consist of three divisions, whereby the different

qualities and temperatures of the various plants can be more eligibly suited. The middle, or main division, may be for all the principal and more hardy, woody, or shrubby kinds, which require protection only from frost; one of the wings appropriated for the succulent tubs; and the other to the more tender but that require occasional heat in winter, but which can live without the heat of a stove or hot-house.

On whatever plans green-houses are constructed, the whole of the inside wall should be neatly finished off with plaster and white-wash, and the wood-work painted white, the bottom being painted with large square paving tiles, or some other similar material.

In the green-house there should be stands, frames, or trestles, which may be moved in and out, upon which rows of planks may be fixed, so as to place the pots or tubs of plants, in regular rows, one above another; by which their heads may be so situated as not to interfere with each other: the lowest rows of plants next the windows being placed above four feet from them, that there may be convenient breadth left to walk in front; and the rows of plants should rise gradually from the first, in such a manner, that the heads of the second row be entirely advanced above the first, the stems only being hid; and at the back of the house a space allowed of at least five feet, for the conveniency of watering the plants, and to admit a current of air round them, that the damps occasioned by their perspiration, may be the better dissipated; which by being pent in too closely often occasion a mouldiness upon the tender shoots and leaves, and, when the house is close shut up, this stagnating, rancid vapour is often very destructive; for which reason they should never be crowded too close to each other, nor should succulent plants ever be placed among them.

In *Plate Gardening*, (*Green-houses*) there is a ground plan and elevation of an improved green-house in which *fig. 1.* shows the front elevation, *fig. 2.* the ground plan, and *fig. 3.* a section of the same.

And at *fig. 4.* is another house of this kind upon another plan.

**GREEN-HOUSE Plants**, in *Gardening*, are such as require the protection of this sort of building during the winter or other season; the following are the principal of the different sorts that demand this kind of treatment.

### *Succulent Kind.*

*Agave*, *agave* or *American aloe*; comprising common great American agave, with entire green leaves, and a branching flower-stalk;—common agave with striped leaves;—Virginian agave, with narrower pale-green leaves.

*Aloe*, *African aloe*; containing mitre-shaped aloe-tree, or sword aloe;—*aloe ferox*;—fan aloe;—saccharine aloe;—soap aloe;—partridge-breast aloe;—tongue aloe;—warted-tongue aloe;—pearl-tongue aloe;—cubweb-aloe;—hedge-hog aloe;—cushion aloe;—spiral aloe;—pentagonal spiral aloe;—triangular spiral aloe;—iris avaria aloe.

*Anthericum*, *spider-wort*; containing shrubby flaked, onion-leaved anthericum;—aloe-leaved anthericum;—black aphodell anthericum.

*Cacalia*, *foreign cili's-foot*; comprising caecilia fecides;—Kleinia or Indian cacalia;—anteuphorbium cacalia;—papillary cacalia.

*Cactus*, *melon-thistle*; containing cactus opuntia, or common Indian fig.

*Cotyledon*, *navel-wort*; containing round-leaved, long-leaved, hemispherical-leaved navel-wort.

*Crasula*, *liver-wort*; containing several species.

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*Euphorbia, euphorbium*; containing most of the forts.  
*Al. fimbryanthemum, fig marigold*; containing many curious species.  
*Sempervivum, live-ever, or boufe-leek*; containing tree-houfe-leek;—variegated tree-houfe-leek;—leffer canary tree-houfe-leek.

### Herbaceous Kind.

*Antholyza, Ethiopian corn-flag*; containing ringent scarlet antholyza;—Ethiopian crimson antholyza;—cunonia, or large fpathed scarlet-flowered.  
*Antirrhinum, snap-dragon*; containing variegated snap-dragon;—Gibraltar spotted flowered linaria;—Dalmatian toad flax.  
*Arifolochia, birth-wort*; containing evergreen arifolochia;—pifolochia, or small birth-wort.  
*Bryonia, bryony*; containing African tuberous-rooted bryony.  
*Calla, calla*; containing sweet calla, or Ethiopian arum.  
*Campanula, bell-flower*; containing American bell-flower.  
*Canarina, canarina*; containing canary bell-flower.  
*Caena, Indian flowering reed*; containing common Indian flowering reed, and varieties;—glaucous Indian reed.  
*Crinum, afphodel lily*; containing African afphodel lily;—broad-leaved afphodel lily.  
*Cyclamen, cyclamen*; containing Perfian cyclamen, and feveral varieties.  
*Erodium, erodium*; containing pentandrous geranium or crane's bill;—thick-leaved erodium;—upright dwarf erodium.  
*Erythrina, coral-tree*; containing herbaceous erythrina.  
*Ixia, ixia*; containing African woolly-headed ixia;—bulbiferous ixia;—flexuous ixia;—corymbose spotted-flowered ixia.  
*Leonurus, lion's-tail*; containing African scarlet leonurus;—friped-leaved leonurus.  
*Ornithogalum, ftar of Babelhem*; containing Cape ornithogalum.  
*Tropaeolum, Indian crefs*; containing double Indian crefs, or nasturtium.

### Shrubby Kind.

*Andromeda, andromeda*; containing tree andromeda, or Carolina forrel.  
*Anthospermum, amber-tree*; containing Ethiopian fmoth amber-tree;—ciliated amber-tree.  
*Anthyllis, Jupiter's beard, or barba Jovis*;—common barba jovis, or fiver bufh;—Spanifh ternate-leaved barba jovis;—dwarf Portugal barba jovis;—ernacea, or prickly anthyllis.  
*Arctotis, arctotis*; containing rough-leaved arctotis;—narrow-leaved arctotis;—fea rag-wort leaved arctotis;—plantain-leaved arctotis.  
*Artemifia, mug-wort*; containing tree wormwood.  
*Afchepias, favaloco-wort*; containing fhrub afchepias.  
*Asparagus*; comprising white prickly afparagus;—declivated brifhly-leaved afparagus;—acute-leaved afparagus;—retrofacted great prickly afparagus.  
*Aster, ftar-wort*; containing fhrubby African after.  
*Atragalus, milk-witch, &c.*; comprising the tragacanth, or goat s-thorn, and feveral varieties.  
*Azorea, deadly night-ftade*; containing fhrubby deadly night-ftade of Spain.  
*Baccharis, ploughman's fpikenard*; containing ivy-leaved baccharis;—oleander-leaved baccharis;—halmus-leaved baccharis.

*Bofea, y rva-mora*; or fhrubby golden-rod tree.  
*Brunia, brunia*; containing knob-flowered, or imbricated-leaved, woolly-leath leaved abrotenoides, or thyme-leaved radiated brunia.  
*Bubon, Macedonian parfly*; containing fhrubby galbaniferous bubon;—fhrubby gummiferous bubon.  
*Buddlea, buddlea*; comprising American long-fpiked, occidental American, globular-headed buddlea.  
*Buphthalmum, ox-eye*; containing fhrubby Jamaica ox-eye;—maritime, or fea ox-eye.  
*Bupleurum, hare's ear*; containing fhrubby Ethiopian hare's ear;—fhrubby difforme-leaved Cape hare's ear.  
*Calendula, marigold*; containing fhrubby Cape marigold;—fhrubby grafs-leaved Ethiopian marigold.  
*Capparis, caper-bufh*; containing fpinous capparid, or true caper fhrub.  
*Caffine, caffine*; containing Cape phillyrea;—Manweema, or Hottentot cherry.  
*Ceanothus, ceanothus*; containing African ceanothus.  
*Celastrus, ftaff-tree*; containing pyracantha-leaved celastrus;—box-leaved;—myrtle-leaved celastrus.  
*Ceratonia, carob-tree*; comprising common carob-tree, or St. John's beard.  
*Chamaerops, chamaerops*; containing dwarf palm.  
*Chryfantemum, chryfantemum*; containing fhrubby canary chryfantemum;—fhrubby fofcular chryfantemum.  
*Chryfocoma, goldy-locks*; containing fhrubby coma aurea, or greater African goldy-locks;—fhrubby nodding goldy-locks.  
*Ciftus, ciftus*; containing bay-leaved ciftus;—fea purflane-leaved ciftus;—and feveral other fpecies.  
*Citrus, citron-tree*; containing lemon-tree, and orange, with all the varieties of each.  
*Cliffortia, cliffortia*; containing fea-leaved cliffortia.  
*Cluytia, alaternoides cluytia*; containing purflane-leaved cluytia;—elateria or Indian cluytia.  
*Colutea, colutea*; containing fhrubby Ethiopian scarlet colutea.  
*Convolvulus, convolvulus*; comprising evergreen canary convolvulus;—filvery convolvulus.  
*Coronilla, coronilla*; containing valentine coronilla;—glaucous coronilla;—filvery coronilla.  
*Dais, dais*; containing catinus-leaved dais.  
*Digitalis, fox glove*; containing fhrubby canary fox-glove.  
*Diofma, African fpiraea*; containing oppofite-leaved, hairy-leaved, red diofma, &c.  
*Elenus, ebony*; containing ebony of Crete.  
*Gniffa, broom*; containing fhrubby canary broom.  
*Geranium, geranium*; containing all the fhrubby kinds.  
*Gordonia, gordonia*; containing loblolly bay.  
*Gorteria, gorteria*; containing fhrubby prickly-leaved gorteria.  
*Grewia, grewia*; containing occidental grewia.  
*Halleria, halleria*; containing African-fly honeyfuckle.  
*Heliotropium, turn-fok*; containing fhrubby Peruvian heliotropium.  
*Hermania, hermania*; containing althaea-leaved, alder-leaved, lavender-leaved, goofberry-leaved hermania.  
*Hypericum, St. John's wort*; containing warted-leaved Minorea St. John's wort;—Carolina St. John's wort;—China monogynous St. John's wort.  
*Jafminum, jafmine*; containing Catalonian jafmine;—Azorian jafmine;—yellow Indian jafmine.  
*Jleris, candy-tuft*;—evergreen tree candy-tuft;—ever-green ftriped-leaved candy-tuft;—ever-flowering tree candy-tuft.  
*Juftea, Malabar nut-tree.*

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- Lantana, American viburnum*; containing African lantana, or flax-leaved jasmine;—sage-leaved lantana.
- Laurus, bay-tree*; containing Carolina blue-berried bay;—red-berried bay-tree;—Indian bay-tree;—cinnamon-tree;—camphire-tree;—deciduous bay-tree.
- Lobelia, lobelia*; containing shrubby, pine-leaved, blue lobelia.
- Lycium, box-thorn*; containing African box-thorn;—Barbary box-thorn.
- Malva, mallow*; containing African shrub-mallow medicago; containing shrubby hoary medicago, or moon trefoil.
- Melia, melia*; containing the bead-tree.
- Mentha, mint*; containing tree-mint.
- Moria, moria*; containing canaliculated-leaved moria;—rush-leaved moria.
- Myrica, gale, sweet-willozo, and candle-berry myrtle*; containing oak-leaved myrica;—Æthiopian heart-leaved myrica.
- Myrtus, myrtle-tree*; containing common myrtle, which comprehends many varieties.
- Nerium, oleander, or rose-bay*; comprising common oleander, with red flowers, scarlet flowers, white flowers, double flowers, striped-leaved.
- Olea, olive tree*; containing European olive tree;—Cape or African olive tree.
- Ononis, rest harrow*; shrubby Spanish ononis.
- Osteospermum, osteospermum*; containing hard-seeded chrysanthemum.
- Othonna, ragwort*; containing pectinated-leaved othonna;—southernwood-leaved othonna.
- Passerina, sparrow-wort*; shrubby African passerina.
- Pelargonium, African geranium*; containing many shrubby species.
- Phlomis, Jerusalem sage*; containing yellow phlomis, and varieties;—purple phlomis.
- Physalis, physalis*; containing alkekengi, or winter cherry;—forniferous winter cherry;—flexuous winter cherry.
- Pistacia, Pistachia nut, and maslic tree*; two or three varieties.
- Polygala, milk-wort*; containing shrubby myrtle-leaved polygala.
- Portulaca, purslane*; containing shrubby Cape purslane tree.
- Poterium, burnet*; containing shrubby prickly burnet.
- Prasium, shrubby hedge nettle.*
- Protea, silver-tree*; containing common silvery protea, or changing tree;—coniferous protea.
- Punica, pomegranate tree*; containing dwarf pomegranate.
- Rhus, sumach*; containing African hoary sumach, and varieties;—African narrow-leaved sumach, and varieties;—shining-leaved African sumach.
- Royena, royena*; containing African bladder-nut.
- Rumex, dock*; containing sorrel tree.
- Ruscus, knee-bally*; containing Alexandrian laurel;—tongue-upon-tongue laurel.
- Salvia, sage*; containing shrubby African golden-flowered sage;—shrubby African blue flowered sage;—Canary sage;—Mexican sage, or shrubby Mexican clary.
- Scabiosa, scabious*; containing shrubby scabious.
- Senecio, groundsel*; containing shrubby African groundsel.
- Sideritis, iron-wort*; containing Canary iron-wort;—Cretan iron-wort.
- Solanum, night-shade*; containing amomum Plinii;—bastard capficum, or winter cherry;—African jagged-leaved solanum, or pomum amoris;—American twin-fruited solanum;—thorny, downy night-shade.
- Tanacetum, tansey*; containing shrubby Æthiopian tansey;—under-shrubby samphire-leaved tansey;—tree tansey.
- Tarhonanthus, tarhonanthus*; containing shrubby African fleabane.
- Tetragonia, tetragonia*; containing shrubby tetragonia.
- Teucrium, germander*; comprising Spanish tree-germander;—broad-leaved tree-germander.
- Ulex, chaffle-tree*; containing evergreen chaffle-tree.
- Ulex, furze or whin*; containing African berry-bearing furze.
- Xeranthemum, xeranthemum*; containing broad-leaved xeranthemum;—narrow-leaved xeranthemum;—trailing xeranthemum.
- Yucca, Adam's needle*; containing common Adam's needle;—thready-leaved Adam's needle;—aloe-leaved yucca;—dragon tree-leaved yucca.
- Zygophyllum, bean caper*; containing sessile-leaved bean caper;—purflane-leaved bean caper.

### Under-shrubby Kind.

- Dracocephalum, dracocephalum*; containing Canary dracocephalum, or balm of Gilead.
- Gnaphalium, gnaphalium*; containing oriental gnaphalium, and varieties;—sweet-scented gnaphalium.
- Inula, inula.*
- Keggelaria, keggelaria*; containing African keggelaria.
- Lavatera, lavatera*; containing Cape lavatera.
- Lavendula, lavender*; containing cat-leaved Canary lavender.
- Lotus, bird's-foot trefoil*; containing Cretan silvery lotus;—lotus Jacobæus;—upright lotus.
- Mediola, mediola*; containing climbing African mediola.
- Origanum, origany*; containing dittany of Crete;—dittany of mount Sipylus;—Cretan marjoram;—origany of Smyrna.
- Periploca, Virginian silk*; containing African hoary-climbing periploca, and varieties.
- Phylica, bastard alaternus*; containing box-leaved phylica;—heath-leaved phylica.
- Phyllis, bastard hare's ear*; or simpla nobla.
- Polygonum, or mountain poly*; containing inarum, or Syrian maffich.
- Rhamnus, buckthorn*; containing broad-leaved Indian rhamnus;—zizyphus, or jujube.
- Sclago, sclago*; containing corymb sclago.
- Suzlax, rough bind-weed*; containing Chinese rough bind-weed, or China-root;—laurel-leaved rough bind-weed, and several varieties of each.
- Stabe, stabe*; containing bastard elichrysum.

It may be observed, that these sorts of plants must constantly be kept in pots, and some large kinds in tubs, for moving into shelter in winter, and into the open air in summer; as, being all exotics from various warm parts of the world, they are of tender growth in this climate, and consequently not able to live in the open air in the winter months.

And the pots and tubs for containing them must be of different sizes, according to the size and nature of the plants, which, as they advance in growth, should have large pots, &c. provided for them accordingly; and when they become wholly too large for the pots, they must be shifted into tubs hooped with iron, with two iron handles to each at the top-part.

It is necessary in potting or planting the different sorts, care should be taken that the pots or tubs have holes at bottom for the discharge of redundant moisture, each hole being

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being covered with a piece of tile or oyster-shell before the mould is put in, to prevent their being flopped up, and the earth from being washed out below.

The best modes of propagating the different sorts, the nature of the earth in which they succeed best, and the season most proper for raising them, are fully explained under the culture of the respective kinds, and may be seen under their proper heads.

*General Method of Management of Green-house Plants.*—As most plants of this sort are capable of bearing the open air from the latter end of May till October; but the rest of the year demand the protection of the green-house, they, of course, require to be set out into it as soon as the weather begins to be suitable, in the spring and summer months; especially for such as all the several varieties of myrtles, geraniums, oleanders, cissuses, philomies, shrubby alder, tree-wormwood, tree-candy-tuft, yellow Indian and Spanish jessamine, Indian bay, &c. &c. And this should be done in the last week in May, or first in June, according as the season proves more or less favourable for all the other sorts: but it should not be attempted till the season is become perfectly settled, and there is a fair prospect of summer being arrived, as there are often very cold nights and frequently frosty mornings in May, and even in the beginning of June, which, if the plants were fully exposed, would pinch the ends of their young shoots and leaves, and greatly injure them. A mild warm day should be chosen for this work; and if a warm rain, it will be of much advantage, as it washes the leaves and branches from the dust they have contracted, and greatly refreshes the plants that are thus exposed to it.

*Method of Setting out the Plants.*—This is done in the more hardy sorts in thin pots about the middle of May.

When first brought out, it is proper to place them in some sheltered sunny place, for a fortnight, till they are inured to the open air; then to set them in any open exposure, where they are to remain for the summer. And as soon as they are brought out, they should be cleared from all dead leaves, and all dead wood; and the earth on the surface of the pots be stirred, taking a little of the old out, and adding some fresh mould in its stead, which will prove very beneficial; then give moderate watering, not only to the mould, but also over the heads of the plants, to clear them effectually from all dirt and filth which they have contracted in the green-house during the winter.

In putting them out, they may be placed according to the fancy of the proprietor; some of the handsomest plants being occasionally placed to adorn spacious fore-courts, or arranged on each side of large walks contiguous to the main habitation; and others near ornamental garden-buildings; they are also sometimes disposed in groups, or small clumps in the most conspicuous places, in different parts of the pleasure-ground; exhibiting different sorts in each group, in order to cause the greater variety and effect in such situations.

As soon as they have been thus placed out, their chief culture is, to supply them plentifully with water during the summer season, in hot dry weather: all the woody or shrubby kinds in particular; likewise the herbaceous kinds that are not very succulent, require it three times a week at least; and in a very hot dry time once every day. The succulent kinds must also have a moderate supply of water two or three times a week in dry weather; the proper time for watering all the sorts at this season is, either in a morning before nine o'clock, or in the afternoon about four or five; for, if performed in the middle of the day in summer weather, the sun would exhale a great part of the moisture before it effected its intended operation on the fibres of the plants: this suffi-

ness should be duly attended to in dry weather. As the mould roots, and fibres of the plants are circumscribed within the narrow limits of a pot or tub, the earth, as well as the fibres, dries very fast in summer, and necessarily requires frequent refreshments of water, to preserve that due and constant degree of moisture which is requisite for the support of healthy vegetation in the different plants.

Even moderate rains should not prevent watering occasionally, especially such plants as have spreading heads, which prevent the rains, unless very heavy or constant, from falling in sufficient quantities on the earth of the pots, to moisten it properly. And in hot weather, if some mowings of short grass are spread on the surface of the orange-tree tubs and others, it will greatly preserve the moisture. During this season, it will also be a good practice to loosen the surface of the earth now and then in such pots and tubs as have a tendency to bind or become stiff by time.

*Manner of taking in the plants.*—About the beginning of the autumn, as towards the latter end of September, the more tender kinds of these exotic plants must be removed into the house; the succulent tribe, in particular, should be removed to shelter at the first approach of excessive wet and cold nights. The oranges, lemons, and all the other species should be moved into shelter in due time, either in the end of September or early in October; for, if they are permitted to remain in the open air till attacked by sharp weather, it changes the beautiful verdure of their leaves to a rusty yellow hue, which they do not recover during winter; therefore, about the latter end of September, or beginning of October at latest, the principal plants should be brought in; the succulent and others of a more tender temperature, as early in the former month as the cold weather begins to come on; and continue moving in all the others as the cold increases; and by the middle of October have the whole collection in the house. As the time approaches for moving in the different sorts, clear them perfectly well from decayed leaves, &c. all the pots being well cleaned, loosening the surface of the earth in each pot, and adding a little fresh mould. As the different sorts are brought occasionally into the green-house, they may be placed promiscuously till the whole are in, and then be arranged regularly, as they are to remain for the winter; leaving all the windows quite open till that time. When the whole is brought in, they should be disposed in regular order, so as to appear to the best advantage, both in respect to their general arrangement and variety, and so as each may have an equal portion of sun and air; the tallest plants being arranged in the back, the others in their several ranks, according to their degrees of height, gradually down to the lowest in front; and as there is a vast variety both in size, shape, and colour, of the foliage, they should be disposed so as to set off each other and give a pleasing variety to the whole; and if possible, they should stand clear of one another; by which each plant will be separately conspicuous, and the whole exhibit a greater air of freedom and variety, as well as admit an equal portion of sun, and a more free circulation of air among them.

When the plants have been thus collected in, their principal culture is the supplying them with fresh air at all opportunities in mild weather, and giving moderate waterings occasionally, picking off decayed leaves, cutting out casual decayed shoots, and making occasional moderate fires in severe weather, also, sometimes to dispel great damps and noxious fogs from them.

With respect to giving air, it should be admitted every mild, calm day, by opening the windows more or less, according to the temperature of the weather. When the plants are

## GREEN-HOUSE PLANTS.

are first hoisted, they should have as much free air as the nature of the season will admit, by opening the windows every mild day to their full extent; and if the air is quite temperate, they may remain open in the nights for the first week; but in cold nights they should be constantly shut; this work of admitting air must be constantly attended to all the winter; for, without a due portion of this essential article in mild weather, the plants soon lose their fine verdure and assume a sickly yellowish colour, become diseased, and the young shoots, in many forts, grow mouldy and rot off, and the leaves of the plants drop; therefore, never omit every mild day, when not very damp or foggy, to open some or all of the windows little or much, according as the air is more or less temperate; the proper time during winter for this, is from about eight, nine, or ten in a morning, till three, four, or five in the evening, according to the mildness of the day; but as the days lengthen and the warm weather increases, give more air in proportion, earlier and later in the day as may be judged proper, being careful always to shut all close in due time every evening, as soon as the sharp air approaches. In foggy weather, it is advisable to keep the windows quite close; for the great damps occasioned by fogs are very pernicious to these plants: whilst they are confined in the house; also, when boisterous or cold cutting winds blow towards the front of the green-house, the whole should be kept shut; or only, if thought necessary, some of the upper sashes drawn down a little way at top, above the reach of the wind rushing immediately upon the plants: likewise, in all froly weather, the house should be kept close, except the frost is moderate, and the middle of the day sunny and warm, when some of the windows may be opened a little, but shut close again if the sun is clouded, and at any rate before the air changes cold: in severe weather, the shutters, &c. should be shut every night, also, occasionally when the frost is extremely rigorous and no sun; and likewise, in such weather, the assistance of fire-heat as hereafter directed may be necessary. As the spring approaches, and the weather grows warmer, enlarge the portion of air accordingly, admitting it also both earlier in a morning and later in the evening as the days lengthen; for then the plants will assume a growing state, and a considerable portion of air is requisite every mild day, both to strengthen the new shoots and inure the plants by degrees to the air against the time for removing them fully into it again for the summer season.

And watering will also be necessary to most of the forts, but must be afforded them as sparingly as possible during the winter months, and scarcely any should be given when the house is obliged to be shut close through the severity of the weather: there are no certain rules to be given for the application of this; some plants require only a little water once a week, or ten or twelve days in mild weather, such as the orange and lemon trees, myrtles, olivanders, shrubby-geraniums, and other woody kinds; all that is necessary being just to preserve the earth very moderately moist; the pots and tubs must therefore be examined with proper attention, and water given to such only as are in want. The herbaceous kinds should be rather more sparingly watered than the shrubby forts; and all the succulent tribe have water but seldom, some not oftener than once a fortnight or three weeks, and that always but very sparingly at each time; and some that are very succulent require but very little from November till March; indeed all the succulents should only have it now and then at this season, when the earth in the pots becomes very dry and hard.

In executing the business of watering in general, care should be particularly taken to do it with great moderation

at the time the plants are in the green-house, and when you once over-wet the earth at this season, it will continue in that state for a long time, and by chilling the tender fibres of the roots of the plants, often cause the loss of the leaves of many of them, and even the death of some kinds. In a sunny day, from about eleven o'clock to two, is the most proper time for having this sort of work done.

Soft water, if possible, should be used, or at least such as had been exposed to the air two or three days, as fresh spring water is much too cold: and during froly weather great attention is requisite to keep all the windows close, night and day, unless when very moderate, as just observed, and the middle of the day is sunny and warm; when some part of the house may be opened a little for two or three hours, having particular regard to shutting all close in due time in the afternoon, before the air changes to become sharply cold: but in very severe frosts it must be kept close night and day, and the shutters or other covers of canvass or mats be also used every night; also, occasionally in the day time, when the weather is intensely severe, and no sun appears, and there are no fires for fires to keep out the frost. The shutters, or other shelters, besides the glaze, should however be used as little as possible in the day-time, except in cases of particular necessity, as every opportunity ought to be taken for the admission of light and fresh air, as much as the temperature of the weather will possibly admit, as most of the plants only want protection from frost and the common shelter of the house, which, with shutting the sashes close every night, will be sufficient for the purpose.

In cases where there are fires for fires, it will be advisable to make moderate ones at such times as the frost cannot be otherwise kept out, especially on nights; but this must by no means be continued longer than is necessary to guard against very severe frosts and the danger of the plants.

In very cold, foggy, damp weather, a moderate fire now and then in the flues also proves very beneficial in expelling the damp unwholesome vapours, so pernicious to all plants of this nature. Whilst the plants are in the house, all decayed leaves, &c. should likewise be constantly picked off, being necessary both to preserve the beauty and health of the plants. The decayed leaves of the succulent kinds should be cut off close with a sharp knife; the plants in general should likewise be occasionally cleaned from any filth they may contract in the house, such as dust, cobwebs, &c.

*General Method of Culture of the Plants.*—These sorts of plants generally want shifting into larger pots and fresh earth as they advance in growth; such as are fast growers, as some of the shrubby geraniums, &c. annually, or every other year; and some plants in large pots, &c. once in two or three years, and others not so often, especially some large grown American alocs, orange and lemon-trees, and these in large tubs, having a considerable substance of earth about the roots. Sometimes these and other similar kinds, when not convenient to shift them, have the top earth, and a little down round the sides, loosened to some moderate depth in the spring, removing the loosened soil, and filling the space up with fresh compost. But as the plants in general increase considerably in proportion to their nature of growth, shifting into larger pots or tubs, with some fresh earth, should not be omitted occasionally as it may seem necessary, as it proves beneficial to most of the forts. They may most of them be shifted with the ball of earth about their roots entire; but others, that are weak and sickly, require shifting into entire fresh earth prepared for the purpose.

The most proper time for shifting all the forts is in April,

or before they are removed into the open air for the summer; but it may be occasionally done in autumn, as in August or the beginning of September, in time to strike fresh root before winter. In the work of shifting, each plant should be drawn out of its pot or tub with the ball of earth about its roots entire, then all the dry matted fibres round the outside of the ball pared off and cleared away, also, some of the old earth at the sides, bottoms, and tops: then having the new pots and fresh earth ready, the holes at the bottoms of the pots should be covered with pieces of tiles or oyster-shells, and some of the fresh earth put in; placing the plant in the pot, and filling up the vacancy all round with more fresh compost, bringing it an inch over the top of the ball, giving a good watering to settle the earth close in every part: after this, it is necessary to place the plants to have shade from the mid-day sun for a week or fortnight, and sometimes longer.

All such plants as are become of a weak sickly nature should, at shifting, have all the earth taken clean from about their roots, having them washed, and then planted into entire fresh earth properly prepared for them.

And the larger sorts of plants, such as the orange-trees, lemons, citrons, American aloes, and others of similar growth, should be shifted, when large, from pots into tubs hooped with iron, having two iron handles at top, as observed above, for the convenience of lifting them in and out of the green-house, as they sometimes grow to so large a size as to require two and sometimes three or four men to move them.

But all such plants as are not shifted annually should, in spring, have the earth in the tops of the pots or tubs loosened to a little depth, also, a little way down round the sides, taking the loosened earth out; and in its stead adding a quantity of fresh mould, giving it directly a little water to settle it close. This should never be omitted when necessary. At any time when the surface of the earth is observed to be stiff, whether in the shifted or unshifted plants, it is of much service to stir it an inch in depth occasionally, and add a little fresh compost when necessary to the plants.

And the mould or compost into which the plants are to be shifted is of considerable importance. The best is obtained from commons where sheep and cattle pasture, particularly in low places, where the finest grass grows and the soil is deepest. A foot of the top soil with the turf should be taken off, and, if a sandy or hazel loam, it will do alone; but if a strong loam, some sand and black peaty, boggy, or moorish soil should be added. Such soils should be laid in a heap six winter months or more, and frequently turned over. Some plants, as aloes, mesembryanthemums, ixias, and exotic liliaceous plants in general, require a soil which is a degree lighter, and which does not retain the water, but lets it pass readily. A little coal-ashes at the bottom of each pot is useful in this view as well as others.

Moss of the ericas, or heaths, and other beautiful plants from the Cape of Good Hope, from America, and Botany Bay, delight and flourish in this sort of earth, which comes nearest to their native soil: thus, the heaths like a black peat or moorish soil; and the others, that which is made a degree stronger, with loamy earth intermixed with it.

It is necessary to keep the heads and every part clean from dirt and other filth, by occasionally washing with water all the sorts, which in moss is done by waterings over their heads; but in others, when very foul, by washing their leaves with a sponge and water, especially in winter.

This is often necessary to the oranges and lemons, and other large-leaved kinds of plants that have been mentioned.

Where the heads of any of the shrubby kinds are become very irregular or shabby, the branches may be pruned shorter or longer, as necessary, in the early spring months.

And where any of the principal exotics assume a declining state, such as oranges, lemons, &c. or have thin, straggling, weakly heads, or are apt to drop their leaves, it is proper either to shift them wholly, or apply some fresh earth to their roots, and then prune the heads moderately close in the early spring, plunging them in a bark-pit under glasses. The heat of the bark-bed so greatly revives their growth, that they break forth into many strong new shoots, and form handsome renewed full heads in the summer season.

While in the green-house, some plants drop all their leaves, either by the effects of cold or over-watering, or sometimes by being kept too long in too dry a state, as frequently occurs in myrtles and geraniums, and sometimes oranges, lemons, and others; in which case it is proper in the spring to prune the heads, shortening the long strong shoots and branches, and to shift them with balls into fresh earth, or, if not shifted, to loosen the earth in the tops and sides of the pots, drawing out the loosened mould, and supplying the place with fresh. They afterwards soon push forth into young shoots and leaves, and renew their heads with verdure. Sometimes myrtles, geraniums, &c. in this state, when headed, may, on being brought forth in the summer, be drawn out of the pots, and plunged in the ground in a sheltered situation, and watered in dry weather; when they will send their roots into the full earth and break forth strongly at top into young wood and foliage, and form full heads, being then re-potted with balls of earth to the roots.

But the heads of green-house plants should never be clipped with garden-shears, nor, by any mode of pruning, trimmed into any formal figure, as sometimes practised; but every sort be let assume its own natural growth, only just using the knife to regulate any very irregular or rambling shoot or branch, or to thin out some where too much crowded, and to cut out the dead wood they may contain in any part of them.

GREENLAND, in *Geography*, comprehends a peninsula generally allowed to be attached to North America, and a number of detached islands, situated in high northern latitudes; the former is called *West* or *Old* Greenland, and the latter *East* or *New* Greenland, and more commonly Spitzbergen.

*West* or *Old* Greenland, is now generally believed to be a peninsula, connected in its north-westerly parts, hitherto unexplored, with America. The reasons alleged for supposing that the N. W. side is contiguous to America, and actually attached to it are the following: Davis's strait, or Baffin's bay, it is said, becomes narrower and narrower towards 78° N. lat.; the coast also, which in other places is very high towards the sea, gradually lowers northward; and the tide, which at Statehook, and even as far as Cockin's sound, in the 65th degree, rises 18 feet at the new and full moon, decreases so much in the north above Disko, that in the 70th degree it does not rise much above eight feet, and probably loses itself entirely at last. Hence captain Baffin gave up all hopes of finding a passage into the South seas through Davis's straits, and consequently concluded, that Greenland joined with America. The Greenlanders report, though much dependance cannot be laid upon their information, that the strait at last becomes so narrow, that they can approach the other side so nearly, as to be able to call to the inhabitants, and strike a fish

from



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from both sides at once: but they affirm, that a strong current runs from the north into the strait, which prevents their coming to one another.

The name Greenland was given to the east side of this territory many hundred years ago by the Norwegians and Icelanders, who are said to have first discovered it, because its appearance was *greener* than that of Iceland. But this east side, sometimes called *Old* or *Left* Greenland, is now almost totally unknown, because ships cannot navigate this coast, on account of the great quantities of floating ice. West Greenland lies between the straits of Davis and Frobisher, and Iceland, and is bounded on the W. by Baffin's bay, on the S. by Davis's strait, and on the E. by the northern part of the Atlantic ocean: but its northern boundaries are unknown. It reaches from the southernmost point of Cape Farewell, and Statenhook, in the 59th degree, on the right side north-eastward, towards Spitzbergen, to the 80th degree; and on the left side opposite to North America, N. W. and N. till about the 78th degree; the coasts having been so far discovered. Most of the Greenlanders live from Statenhook to the 62d degree, or, as the inhabitants say, in the south; but as no Europeans live there, these parts are imperfectly known. The interior of this dreary country is extremely mountainous, and some of the mountains are so high that they may be discerned at the distance of 40 or 60 leagues. This is particularly the case with that which is the highest mountain in the country, called "Hiorte-tak," or stag's-horn. It has three branches or points, the most lofty of which serves as a sea-mark to navigators, and also as a weather-gage, for when a storm is approaching from the south, the summit of this mountain is enveloped in a small misty cloud. The hills and rocks of this country are covered with perpetual snow; though the low lands on the sea-coast are clothed with verdure in the summer season. The ice and snow, like the glaciers of Switzerland, fill the elevated plains, and even many vallies. The coast is indented with many bays and creeks that enter far into the land: and it is encompassed with innumerable large and small islands, and both visible and imperceptible rocks. The shore, however, is in many places inaccessible on account of the floating mountains of ice. This country is said to have been discovered by some emigrants from Iceland: the distance, according to the best maps, being about 8° of longitude, in lat. 66°, or nearly 200 geographical miles, though some maps reduce it to 5°, or not more than 130 geographical miles. The discovery was accidentally made by Eric Raude, or the red-headed, who being exiled from Iceland on account of the murder of one of its chiefs, found this country; and, coasting along the S. W. border, wintered at an agreeable island near a found, which he called Eric's found. Having in the following year examined the main land, he returned in the third year to Iceland: and in order to induce the inhabitants of Iceland to accompany him he called it Greenland, expressing its verdant appearance, and represented it as abounding with pasture, wood, and fish. The effect of his representation was such, that in the succeeding year he was followed by twenty-five ships full of colonists, who had furnished themselves richly with household goods and cattle of all sorts: however, only fourteen of these ships arrived safe; but in process of time more colonies flocked to Greenland, both on the east and west side, from Norway as well as Iceland. Torfæus, a native of Iceland, in his "Groenlandia Antiqua," dates the discovery of Greenland in the year 982. But it has been inferred from a bull issued by pope Gregory IV. in 835, and which commits the conversion of the northern nations, and in express words, of the Icelanders and Greenlanders, to the first northern apostle Ansgarius, (if this bull be indeed authentic,)

that Greenland must have been discovered and planted about the year 830, by the Icelanders and Norwegians. Leif, the son of Eric Raude, is said to have made a voyage to Norway, A. D. 999, to give the king, Olaus Tryggvason, an account of the new colony in Greenland; and this king, having just renounced heathenism, converted Leif, and persuaded him to be baptized, and to take with him to Greenland a priest, for the conversion of the inhabitants. Upon his return his father was induced to embrace Christianity, and the rest of the colony followed his example. In the year 1122 they chose Arnold, a Norwegian, for their bishop; and he fixed his episcopal residence at Gardar. In the year 1261, they, and the Icelanders, subjected themselves voluntarily under the Norwegian sceptre; and from that time they were governed by a king's deputy from Norway, according to the laws of Iceland; and when an archbishopric was created at Drontheim in Norway, the Greenland bishops became suffragans to this metropolis. The intercourse between this colony in Greenland and Norway continued, with little interruption, till the beginning of the 15th century; the last of 17 bishops being appointed in the year 1406. During this period the Greenland trade is said to have been very considerable; and it is very probable that they exported a large quantity of flesh, butter, cheese, fish, train, and pelts, chiefly by means of foreign ships; for though the Norwegian settlers in Greenland, upon their first establishment, sailed in their own vessels from Iceland and Norway to this country, they afterwards very much neglected navigation. After the period above-mentioned Greenland seems to have been little regarded, and its intercourse with other countries almost wholly ceased. In order to account for this sudden change of condition, it should be considered, that the first settlers were very much harassed by the natives, who were a barbarous and savage people, and who resembled, in their customs, garb, and appearance, the Esquimaux found about Hudson's bay. These people were denominated "Skrallings," or "Körralit," an appellation assumed by the Esquimaux. The Danish Chronicle, a work written in verse, and, indeed, of doubtful authority, though cited by Torfæus, informs us, that certain Armenians were first driven hither by a storm, and that from hence they peopled Norway and America, and that many tribes were found in Greenland, who were governed by different chiefs. The Skrallings, it is supposed, and not without some degree of probability, first came to Greenland in the 14th century, not from the east out of Europe, but from the west out of North America. But their origin is traced to the N. E. regions of Great Tartary, between the Ice-sea (mare glaciale) and Mungolia. They first came into Tartary, after the great dispersion of the nations, and were driven on further and further by imperious or more potent nations that followed them, till at last they were compelled to withdraw into the remotest corner of Tartary near Kamskatka, and from hence they migrated to America; extending themselves round the S. E. part of Hudson's bay, or through Canada as far as the North sea: and here, it is supposed, they were first found by the Norwegians in the 11th century. Dreading and wishing to avoid the molestation which they suffered from the other Indians, these fugitives retreated northwards, till, probably, in the 14th century, they either crossed Davis's straits in their boats, from Cape Widdingham, in the 66th degree, to the South-bay in Greenland, which can be scarcely 60 leagues wide; or else they went higher up by Baffin's bay, and so came down on the parts where the Norwegians formerly had their habitations, first on the west side, and then by degrees round to the east. These Skrallings are supposed to have exterminated the Ice-

land and Norwegian settlers who inhabited the western district, in the 14th century; after they had been previously diminished in number, or very much enfeebled by a pestilence, which raged about the year 1350. On this occasion the Norwegians were driven from the west to the east side, so that the western parts of Greenland were wholly occupied by these Skrællings. Some of them blended themselves with their conquerors, and others of them receded farther northwards into the inlets between the mountains. The ancient settlement contained several churches and monasteries, from which it would seem that the colony extended over about 200 miles in the south-eastern extremity. On the west some ruins of churches have been also discovered. In the eastern district, as we have reason to imagine, there are some remains of the ancient colony, though no intercourse can be maintained between the inhabitants of both sides of the country, on account of high mountains, perpetually covered with snow, which separate the two parts of Greenland; and the navigation from one to the other is impeded by the mountains of ice, that are driven southward from Spitzbergen, or East Greenland. From authentic records we can derive little information that is satisfactory, or upon which we can rely. From some of the most credible we learn, that Greenland was divided into two districts, called "West Bygd," and "East Bygd;" the former contained four parishes, and 100 villages; but the latter was more flourishing, as it is nearer to Iceland, and was sooner settled, and also more frequented by Norwegian navigators. The colony that first settled in the east, of which we have already given an account, is said to have comprehended, in ancient times, 12 extensive parishes, 120 villages, a bishop's see, and two monasteries. The present inhabitants of the western district are separated from those of the east by impassable deserts and mountains, so that they know little of one another; excepting that the eastern Greenlanders are thought by those of the west to be a cruel and barbarous nation, that destroy and eat all strangers that fall into their hands. For about a century after the cessation of intercourse between the Greenlanders and other nations, they were very much neglected; all the attempts made by the kings of Denmark to explore the eastern district having miscarried. At length, in the year 1578, Frederic II. sent the famous navigator, Magnus Henningsen, who, having encountered much danger from storms and ice, and gained sight of land, was obliged to return, probably on account of some unfounded apprehensions which deterred him from proceeding farther. About two years before this event, viz. in 1576, queen Elizabeth sent out Martin Frobisher to find a N. W. passage to China; he discovered land, which he named "meta incognita," and particularly the straits which bear his name; and traded with the Indians. On his return he brought with him a black stone, from which gold was extracted. In the year 1578 he was sent out again with a view of establishing a colony in Greenland, but he returned, after a stormy passage and several disasters, with as much of the mineral earth or ore as he could procure, and the design was never prosecuted. Frobisher was followed, in the year 1585, by John Davis, who sailed as high as N. lat. 64° 15', *i. e.* to Ball's river, where he landed and traded with the natives. Then, and in the two following years, he discovered the coasts of America as high as the 70th degree, and gave the straits his own name. In the year 1605, Chrillian IV, king of Denmark, sent the Danish admiral Godike Lindenow, accompanied by John Knight, an English mariner, to reconnoitre the coasts of Greenland: the inhabitants on the west side were found to be much wilder than those on the east side, nor did they at all resemble one another in their language, dress, and manners. Voyages

of a similar nature were repeated, but no permanent advantage resulted from them.

At length, in the year 1721, a pious clergyman of Norway, Hans Egede, having long lamented the wretched condition of the Greenlanders, through the want of religious instruction, as well as a variety of worldly comforts, and having projected, from the year 1708, schemes for their relief, without effect, determined to relinquish his church preferment, and to make a voyage to Greenland, with a view of accomplishing his benevolent intentions. After having collected a capital of about 2000*l.*, by various subscriptions, and obtained from the king an appointment of missionary, with the yearly salary of 60*l.*, besides a present of 40*l.* towards his equipment, Mr. Egede placed himself at the head of a colony of 40 persons, and sailed for Greenland. These adventurers, having passed Statenhook, encountered many dangers from storms and ice, happily landed at Ball's river, N. lat. 64°, on an island near Kangek, which they called after the name of the ship in which they had sailed, "Haabats-Oe," *i. e.* Hope island. They were hospitably received by the natives, and Mr. Egede took great pains, by his condescending attention, and by the assiduity with which he communicated to them religious instruction, to conciliate their friendly attachment. He also took great pains to acquaint himself with the language of the country, and to discover the best places for hunting and fishing, so as most effectually to serve the convenience of the colony. He made repeated attempts for exploring the eastern side of the country, and for discovering Frobisher's straits, but the wind and ice rendered his efforts unsuccessful. As a missionary, he discharged the trust which he had undertaken with singular fidelity, diligence, and zeal, and having continued in this inhospitable region till the year 1736, he returned to Denmark with a debilitated constitution. He was soon after appointed superintendent of the mission in Greenland, with a salary of 100*l.* per annum, and was ordered to found a seminary of students and orphans, whom he was to instruct in the Greenland language, and who were to supply a succession of missionaries and catechists. He spent his latter years in a recess with his daughter, on the island of Falster, and there closed his life of service and honour, November 5th, 1758, in the 73d year of his age. To him and to his son, Paul Egede, we are indebted for the most ample and authentic account of modern Greenland. The example of Mr. Egede has been since followed by several missionaries, particularly from among the Moravians, whose principal settlements were at Kangek, New Herrnhuth, and Lichtenfels. From Mr. Egede we learn that the most practicable method of reaching the eastern part of Greenland will be to coast north about in small vessels, between the great flakes of ice and the shore; the Greenlanders having always declared, that the currents, which rush from the bays and inlets, and run south-westward along the shore, hinder the ice from adhering to the land, so that there is always a channel open, through which vessels of small burden may pass, especially if lodges were built at convenient distances on the shore, for the accommodation and direction of the adventurers. The part of the country that is now visited by the Danes and Norwegians, lies between the 64th and 68th degrees of N. latitude, and so far the climate is found to be temperate. We are told, however, that the country is inhabited as far as 76°; but the Danish and Moravian settlements are chiefly in the south-west, though at one time there appears to have been a factory as far north as 73°.

In the summer, from the end of May to the middle of September, the weather is warm and comfortable, when the wind blows from the east: though violent storms then occur,

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and the fogs on the sea-coast are insalubrious. The land near the shore exhibits a pleasing verdure, but the inland mountains are perpetually covered with ice and snow. Beyond the 68th degree of latitude the cold is very intense, so that the rocks often burst by the frost; and towards the end of August, the whole coast is covered with ice, which never thaws till April or May, and sometimes not till the latter end of June. The prodigious masses of ice that surround the whole coast exhibit an appearance, in calm weather, no less dazzling than dreadful, by the reflection of the sunbeams in its variety of colours; but when the wind blows and the waves are lifted up in mountain billows, these masses of ice dashing against one another occasion shocks that make the observer tremble. Thunder and lightning seldom occur in Greenland, but the Aurora Borealis has frequent and brilliant appearances. At the time of new and full moon, the tide rises and falls upon this coast about three fathoms, and the springs and fountains on shore rise and fall with the flux and reflux of the ocean.

The soil of Greenland resembles that of other mountainous countries, the hills being barren, and the vallies and low grounds, especially near the sea, rich and fruitful. It is, for the most part, unfertile clay or sand. But whatever is said of the fertility of Greenland is applicable only to that part which lies between the 60th and 65th degrees of latitude. The most northern parts are totally destitute of herbs and plants. This country is said to have formerly produced a great number of cattle, and to have exported considerable quantities of butter and cheese to Norway. Some parts of the country yielded excellent wheat, and the oaks that grew in it were so large as to furnish acorns as big as apples. In its present state, however, though some oaks remain, and the traces of ploughed land are perceivable, Greenland is destitute both of corn and cattle; but its pasture is good, and if the soil were properly cultivated, it would probably yield grain. It produces excellent turnips and coleworts. The sides of the mountains near the bays are clothed with wild thyme, of powerful fragrance. The country abounds also with many other plants, and among its fruits we may reckon juniper-berries, blueberries, bilberries, and bramble-berries.

The animals which are most abundant, are rein-deer, dogs resembling wolves, (see DOG,) arctic foxes, and white or polar bears. Hares of different colours are common, but they are smaller than those of Denmark and Norway. The walrus, and five kinds of seals, frequent the shores. Here are found also ravens in great numbers, eagles of a very large size, falcons, and other birds of prey, and likewise a linnet, which warbles very melodiously. Whales, sword-fish, porpoises, &c., abound on the coasts; and also halibut, turbot, cod, haddock, &c. The species of insects exceed 90. The more dubious animals, which are said to inhabit these seas, are the mermaids, sea-serpents, and krakens. The polar bears, seals, and manati, says Pennant, (*Arctic Zoology*;) were originally natives of these countries. The other quadrupeds found their way here from either Hudson's bay or Labrador, on the islands of ice. The arctic fox found the same kind of conveyance from Greenland to Iceland as it did with the rein-deer to Spitzbergen. To the last was waisted, probably from Labrador, the common weasel, the red or common fox, and the mouse, which missed Greenland, but stocked Iceland; and the common bat, which was originally tempest driven to the latter from Norway; the wolverene and varying hare never reached farther than Greenland. This, says Pennant, seems the progress of quadrupeds in the frigid zone, as high as land is found.

Greenland is thought to contain many mines of metal. To the southward of the Danish colony are some appear-

ances of a mine of copper; Mr. Egede once received a lump of ore from one of the natives, and here he found calcarene of a yellow colour. Crantz observes, that the highest mountains of this country are on the west side, and the rocks are full of clefts, commonly perpendicular, and seldom wider than half a yard, filled with spar, quartz, talc, and garnets. The rocks are generally rather vertical or somewhat inclined, consisting of granite, with some sand-stone and lapis olariz. Crantz also mentions micaceous schistur, coarse marble, and serpentine; with asbestos and anianthur, crystals, and black schorl. It is said that flint of argill, a new substance, has been recently found in Greenland; and this is perhaps the lost transparent stone of Crantz. The lapis olariz is of singular utility in Greenland, and the north of America, as it is used for lamps and ordinary utensils.

The present inhabitants of the western coast of Greenland, and who are the descendants of the ancient Skrellings, whom we have already mentioned, and who exterminated the Iceland colony, very much resemble the American Samoeds and Laplanders in their persons, complexions, and way of life. They are without doubt a branch of the Esquimaux of Labrador, who fled that country, and peopled Greenland. They are short, brawny, and inclined to corpulency; with broad faces, flat noses, thick lips, black hair and eyes, and a yellowish tawny complexion. They are for the most part vigorous and healthy, but very short-lived, few reaching the grand climacteric, and many dying in their infancy, and in the prime of their youth. The sharpness of the wind, and the glare of the snow, render them subject to a disorder of the eyes. They are also afflicted with the leprosy; and those who inhabit the northern parts are miserably tormented with dysenteries, rheums and pulmonary disorders, boils, and epilepsy. The small-pox in 1734 made dreadful havoc among these people, who have no aid from medicine, and who depend merely on their "Angekoks," or conjurers. The Greenlanders, with regard to their constitutional temperament and disposition, are cold, phlegmatic, indolent, and dull of apprehension; but quiet, orderly, and good-humoured. They live peaceably together; and have every thing in common, without strife and animosity; and to strangers they are civil and hospitable. They never wash themselves with water, but lick their paws like the cat, and then rub their faces with them. They eat after their dogs without washing their dishes; devour the lice which devour them; and even lick the sweat, which they scrape off from their faces with their knives. The women wash themselves with their own urine, under a notion that it makes their hair to grow; and in the winter-time immediately expose themselves to the air, that the liquor may freeze upon their skin.

In their general habit and manner they are intolerably filthy. In times of scarcity they subsist on pieces of old skin, reeds, sea-weed, and a root called "tugloronet," dressed with train oil and fat. The dung of rein-deer taken from the intestines, the entrails of partridges, and all sorts of offals, are counted dainties among these savages; and of the scrapings of seal-skins they make delicate pancakes. The Danish provisions were at first tasted by them with disgust and abhorrence; but they are now become fond of bread and butter, though they still retain an aversion to tobacco and spirituous liquors. The Greenlanders in common content themselves with one wife, who is condemned to drudgery, and liable to be divorced at the pleasure of the husband. Persons of superior rank and qualities are, however, indulged with a plurality of wives. Their young women are generally chaste and bashful; nevertheless, at some of their feasts the men retire with the wives of their neighbours for licentious amours. Their superstitious customs are innumerable; e. g. w. l. c. 1

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a woman is in labour, the gossips hold a chamber-pot over her head, as a charm to hasten the delivery; and when a child is a year old, the mother licks and flabbers it all over, to render it, as she imagines, more strong and hardy. Their cloaths are made of the skins of rein-deer, seals, and birds. The men wear their hair short, commonly hanging down from the crown of their head on every side, and squared off at their foreheads. Some cut it off as high as their poll. But it would be a reproach to a woman to cut off her hair, which is never done except in cases of the deepest mourning, or if they resolve never to marry. All the Greenlanders speak the same language, though different dialects prevail in different parts of the country. Some few words are probably the relics of the old Norwegian; but these excepted, their language seems to have no affinity in etymology, declension, or signification, with any of the Northern, Tartarian, or Indian languages, as far as they are known to us; but we must except the language of the Esquimaux in Labrador, who seem, as we have already said, to be one people with the Greenlanders. Their great number of polysyllables, and of repeatedly combined words, make their language very intricate. Nevertheless, it abounds so much with words, that the Greenlanders, like the Chinese Tartars, have a proper word for every object or art that requires the least distinction. Besides, their words are varied and declined with such different modifications, yet according to a fixed rule with few exceptions, and are attended with prefixes and suffixes, far more than the Hebrew, that the language is not only graceful, but plain and unequivocal. Moreover, they join many words together, as we have already said, like the North Americans, so that they can express themselves very concisely and yet significantly. Some of our letters are wanting in their language, and they never begin a word with B, D, I, G, L, R, or Z. They seldom join many consonants together, and never at the beginning of a syllable. The accent, upon which much depends, must be laid upon the proper syllable, commonly the last; and the Greenlanders, especially the women, accompany many words, not only with a particular accent, but with a certain significant aspect, which is necessary to be regarded in order to ascertain their meaning. They have but few adjectives, and these are mostly participles; they are placed after the substantive, which always begins the sentence. Substantives, as well as verbs, have singular, dual, and plural numbers, but no genders, and they want no article. The dual and plural are formed according to the different termination of the word, with few exceptions. The declensions are easy; the genitive has at the end a *U*, or if a vowel follows, an *u*, either by addition or elongation; and the rest of the cases have a preposition annexed to them. The pronouns are not placed before the word, but one or two of its letters are attached to it at the end, and in different ways according to the different numbers. They have only five prepositions, which are not set before the nouns, as in other languages, but at the end, and again annexed in declining. The verbs have been divided into five conjugations, according to their terminations. They have three tenses, the present, preterperfect, and future; and they have six moods, the indicative, imperative, permissive, conjunctive, and infinitive. The Greenlanders have no verb dependent nor passive, but the latter are formed from the active by some adjunction. They have several classes of adverbs, like other nations; but their numerals are few, so that they can scarcely count five; but in order to arrive at 20, they count the fingers of both hands and the toes of both feet. If they want to proceed farther, they begin again with their fingers and toes. They tack their conjunctions to the end of a word, as the Latins do their

que; and they do not want interjections. Their syntax is simple and natural; the capital word stands in the front, and the rest follow in order according to their importance. Their style or mode of speaking is not at all hyperbolic, pompous, or bombast, like that of the orientals, but simple and natural; yet they are fond of similitudes and metaphors. Their poetry has neither rhyme nor measure; but it consists of short periods; which, however, are sung to a certain time and cadence.

The Greenlanders have no traditions of the most memorable events of their ancestors in heroic songs, as other nations have, who possess no written records. All they can say of their progenitors is, that they were brave seal-catchers, and that they killed the old Norwegians. Yet in their satirical songs, to which they are much addicted, they are more acute. They are well versed in genealogy, and can often trace their pedigree as far back as ten of their progenitors, together with all the collateral branches. Their imperfect arithmetic we have already noticed. Of writing they have no conception. On their first acquaintance with Europeans, they were frightened by speaking paper. In chronology, they reckon their years by winters, and their days by nights. They are not learned enough to fix the equinoxes, but they can guess at the winter solstice, within a few days by the fun-beans upon the rocks; and then they celebrate their new year by a fun-feast. From hence they reckon three full moons to the spring, and then they move from their winter houses into tents. In the fourth moon, *i. e.* in April, they know that the small birds make their appearance, and the ravens lay eggs. In the fifth their angmarfet, and the seals with their young ones give joy to their coats by their revolutionary visit. In the sixth the eider-fowls breed. When they lose the moon in the bright summer nights, they carry on their calendar partly by the growth of eider-fowls, and size and shape of the seals, and partly by the rising of the sun on the dial of the rocks and mountains; so that they exactly tell when the seals, fishes, and birds will arrive in flocks and shoals here and there, and when it is time to repair to the winter-houses, in which they generally shelter themselves soon after Michaelmas. They divide the day according to theebb and flood, and the night by the rising and setting of certain stars. They think the globe of the earth stands upon posts, which are so rotten with age, that they often crack; and that they would have sunk long ago, if they had not been kept in constant repair by the Angekoks, who sometimes bring back a piece of rotten wood as an evidence of their important service. Their astronomy makes the firmament to rest on a lofty pointed hill in the north, and on that centre it performs its revolutions. But this specimen is sufficient. When it thunders, two women are stretching and flapping a dried seal-skin, and the thunder is occasioned by that rattle. The mystery of the Aurora Borealis is unravelled by the souls of the dead frisking at a dance or a foot-ball. The rains are the overflowings of the celestial reservoir; and if the banks should break, the sky would fall down. Such is their meteorology! In medicine and surgery they are no less ignorant than in the other sciences.

When a Greenlander is in the conflicts of death, they array him in his best cloaths and boots, and bend his legs up to his hips, probably that his grave may be the shorter. After death, they silently bewail him for a short hour, and next prepare for his burial. The corpse, being wrapped and sewed up in the man's best seal or deer-skin, is laid in the burying place, covered with a skin, and also with some green fods, and finally with heaps of great broad stones to keep off the birds and foxes. Near the burying spot they deposit the

the kajak and darts of the departed, and the tools he daily used; or if the deceased was a woman, her knife and sewing implements, that they might not be defiled by them, or sorrow too much on their account, or because they should want them in another world. After the interment, those who attended the procession, betake themselves to the house of mourning: then the men sit silent for some time with their elbows leaning upon their knees, and their heads between their hands; while the women lie prostrate upon their faces on the ground, and softly weep and sob. Then the nearest relation pronounces an eulogy, reciting the good qualities of the deceased, and at every period deploring his loss with loud crying and weeping. After this mournful ditty, the women continue their lamentations in a tremendous howl. This kind of mourning is continued for a week or a fortnight. The howling is after intervals renewed, and prolonged for some weeks, and in some cases for a whole year.

As for the religion, or rather the superstition of the ancient Greenlanders, they are reported to be such gross idolaters as to worship the sun, and sacrifice to the devil, that he might forward, or at least not hinder, their hunting and fishing. The first missionaries, however, conceived that the Greenlanders had no kind of religion or idolatrous worship; and that there was not any observable trace of their entertaining any conception of a Divine Being. Others, however, have thought, with greater reason, that a faint idea of the Divine Being lay concealed in the minds of these people, because they directly assented without any objection to the doctrine of God and his attributes. Among the Greenlanders, different opinions are entertained concerning the soul of man; some supposing that it is material or corporeal, and others that it is a spiritual essence, different from the body, and all material subsistances, and capable of surviving after death. They seem to have some confused and indistinct notions of a future state; of the place which is to be the final abode of good men; and of the nature of their reward. The most stupid Greenlanders, it is said, conceive a horror at the thoughts of the entire annihilation of the soul. They place their hell in the subterraneous regions, which are devoid of light and heat, and filled with perpetual terror and anxiety. The Greenlanders speak of other superior and inferior spirits, besides the soul of man, which bear some resemblance to the major and minor gods of the ancient heathens. Of the first rank there are only two; a good spirit and a bad one. Besides the great spirits to an audience with whom an *Angekok* only can be admitted, there are other lesser spirits in all the elements.

The Greenlanders believe in apparitions, of the ghosts of the deceased. The "*Angekoks*" are their foretellers or diviners, to whom peculiar privileges and honours belong. Although the Greenlanders have neither religion nor government, they are free from many of the grosser vices, which may be found among persons much more enlightened than themselves.

The traffic of the Greenlanders is very simple and concise, and is carried on altogether by barter. They very rarely cheat, or take the advantage of one another, much less steal, which they reckon infamous; but they glory in over-reaching, or robbing an European, because they think it is a proof of their superior wit and ingenuity. Their traffic is carried on partly among themselves, and partly with factors and seamen. Wherever there is a great assembly, or rendezvous of Greenlanders, as at a dancing match, or the sun-feast in winter, there are always some that expose their wares to view, and announce publicly what goods they want in exchange. As those in the south have no whales, and those

in the north no wood, many boats of the Greenlanders coast every summer out of the south, and even from the east side of the land, and proceed from two to four hundred leagues, as far as Disko, with their kajaks and women's boats, and the tackle and implements belonging to them, and barter wood for the horns of the unicorn fish, teeth, bones, whale-bones, and whale's sinews, and part of these they take on their return home. In these voyages they take with them their whole family and subsistence; and sometimes form a new settlement in the course of their voyage. The Greenlanders vend their fox and seal-skins, and especially their blubber, to agents or factors, and receive in return iron points for their darts, knives, lock-saws, gimblets, chisels, and sewing needles; also, striped linen and cotton, kerseys, woollen stockings and caps, handkerchiefs, chests or boxes, wooden dishes, pewter plates, copper kettles, looking-glasses, combs, ribbons, and all sorts of toys for children. They are fond of buying snuff, also guns, powder, and shot; tobacco, which they use only as snuff, serves instead of small money with them. Indeed, they expect a little tobacco for every service they perform.

The assembly for dancing, and the sun-feast above-mentioned, are not religious acts or ceremonies, but mere sports and amusements. The sun-feast is kept at the winter solstice, to rejoice at the return of the sun, and the renewal of good hunting and fishing weather. For this purpose they assemble all over the country in large parties, and treat one another in the best manner they are able. When they have gorged themselves with food, they rise up to play and to dance. The means of intoxication they do not possess, and drink only water. Their only musical instrument is the drum, which is beaten to common musical time. The music and dancing are accompanied with a song in honour of seal-catching, and such kinds of exploits: the performer extols the noble deeds of his ancestors, and expresses his joy at the return of the sun in the hemisphere. Every stanza of his ode is accompanied by the auditory. The following is a specimen of a complete cantata; the second and fourth lines expressing the chorus:

"The welcome sun returns again,  
Amna ajah, ajah, ah-hu!  
And brings us weather fine and fair,  
Amna ajah, ajah, ah-hu!"

Such dancing meetings are appointed at other seasons of the year, when they have leisure to attend them. It is somewhat singular, and deserves mention, that they decide their quarrels by singing and dancing, and they call this a "*Singing Combat*." A Greenlander, who conceives himself injured, composes a satirical poem, and repeats it to often with singing and dancing, till his domestics, and particularly the women, are able to remember it. He then publishes a challenge that he will fight a duel with his antagonist, not with a sword but with a song.

The respondent appears in the appointed place; when the accuser begins to pronounce his satire to the beat of the drum, and his party join with repeating "*Amna ajah*," which occasions laughter among the attendants.

The defendant then retorts in the same manner, and the laugh changes sides; the plaintiff again renews the same kind of assault. The whole body of attendants constitute the jury, and confer the hand on the victor, and afterwards the two contending parties are the best friends.

The Greenlanders are employed through the whole year in fishing or hunting. At sea they pursue whales, morse, seals, fish for food, and sea-fowl. On shore they hunt the rein-deer in different parts of the country. And they have

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methods peculiar to themselves, and corresponding implements, for accomplishing their objects both by sea and land; which we shall not here describe. The Greenland canoe, or "kaiak," like that in Nova Zembla and Hudson's bay, is about three fathoms in length, pointed at both ends, and  $\frac{1}{2}$  of a yard in breadth. It is constructed of thin rafts fastened together with the sinews of animals, and covered with dressed seal-skin, both above and below, so that only a circular hole is left in the middle, large enough to admit the body of one man. Into this the Greenlander thrusts himself up to the waist, and fastens the skin so tight about him that no water can enter. Thus secured, and armed with a paddle broad at both ends, he ventures out to sea in the most stormy weather to catch seals and sea-fowl; and if he is over-set, he can easily raise himself by means of his paddle. The "kone-boat" is made of the same materials, but more durable; and so large, that it will contain 50 persons with all their tackle, baggage, and provisions. It is fitted with a mast, which carries a triangular sail made of the membranes and entrails of seals, and is managed without the help of braces and bowlines. These kones are flat-bottomed, and sometimes 60 feet in length. They are left to the conduct of the women, who are obliged to do all the drudgery, including even the building and repairing of their houses, while the men are wholly employed in preparing their hunting implements and fishing-tackle.

Greenland is a country very thinly inhabited. In winter they live in houses and in summer in tents. The houses are constructed of stones, on a sleep rock, with layers of earth and sods between them. On these walls they rest the beam, or connected beams, for the length of the house, being from 4 to 12 fathom; and over these they lay the rafters, with small wood between them; the whole is covered with bilberry-bushes, and then with turf, with fine earth on the top. Their houses have neither door nor chimney; the use of both being supplied by a vaulted passage made of stone and earth, entering through the middle of the house. The walls are hung on the inside with old worn tent and boat skins, fastened with nails made of the ribs of seals; and the roof is covered with them on the outside. In these huts, so constructed, they are guarded from wind, damp, and cold. The floor is divided into several apartments, separated by skins, according to the number of families for which it is designed. On these floors they sleep on pelts; and they commonly sit in them all day long, the women cooking and sewing, and the men carving their tackle and tools. On the front wall of the house are several square windows, about two feet in size, made of seal's guts and halibut's maws, and sewed so neat and tight, that the wind and snow are kept out, and the light let in. These huts are well warmed with fires, and lighted by means of lamps filled with train oil, and furnished with moss instead of a wick, which burns so bright that the house is both lighted and warmed by it. Over the lamp is suspended a bailard-marble kettle, in which they boil all their meat; and over this again is a wooden rack, on which they lay their wet cloaths and boots to dry. On the outside of their dwelling-house they have their little store-houses, in which they lay up their little stock of fish, fish, train oil, and dried herrings; and close by their store-houses they lay their boats, with their bottoms upwards, under which they hang their hunting and fishing tackle and their skins. Their summer tents are made with poles, put together in a conical form, covered on the inside with reindeer skins, and on the outside with seal-skins, doubled, or so dressed that the rain cannot penetrate them. Crantz's History of Greenland, vol. i.

GREENLAND, *East*, or *Spitzbergen*, was formerly con-

sidered as part of the continent of West Greenland, but it is now known to be a collection or group of islands, varying in their extent, and lying between  $76^{\circ} 46'$  N. lat. the latitude of the South Cape, and  $80^{\circ} 30'$ , the northernmost point of the Seven Islands, and between  $9^{\circ}$  and  $23^{\circ}$  E. long. Sir Hugh Willoughby, who first discovered land in this high northern latitude, A. D. 1553, called it *Greenland*; conceiving it to be part of the western continent. It was afterwards visited, A. D. 1595, by William Barentz and John Cornelius, two Dutchmen, who claimed the honour of the first discovery, and called the country "Spitzbergen," or sharp mountains from the numerous sharp pointed and rocky mountains which they observed in it; and in order to ascertain their own claims, they pretended that this was not the country discovered by Sir Hugh Willoughby, which in the maps and charts delineated by the Hollanders was denominated "Willoughby land," though no such land ever existed. It is moreover said, that before the voyage of these Dutchmen, an English navigator, whose name was Stephen Burrows, had coasted along a desolate country from  $78^{\circ}$  to  $80^{\circ} 11'$  N. lat. which must have been Spitzbergen. This country was also visited at different times by navigators, who were employed in exploring a passage to the East Indies by the north-pole; a project which was suggested and strongly recommended by Robert Thorne, a merchant of Bristol, as early as the year 1527. Bourne, in his "Regiment of the Sea," written about the year 1577, mentions this as one of the five ways to Cathay, and seems to admit the practicability of it from a mistaken notion of the mildness of the climate near the pole, owing to the constant presence of the sun during the summer. In 1607, a voyage was proposed by some London merchants, for the discovery of a passage by the north pole to Japan and China, and it was undertaken by Henry Hudson, who fell in with land to the westward in  $73^{\circ}$  N. lat.; and soon after he fell in with Spitzbergen, where he met with much ice; and this navigator advanced to the latitude of  $80^{\circ} 23'$ ; but he was prevented from proceeding farther by the ice. In 1609, Jonas Poole was appointed by the Muscovy company on the same service; and he with much difficulty made the south part of Spitzbergen, afterwards sailing along and founding the coast, giving names to several places, and making many very accurate observations. Having twice attempted in vain to get beyond  $79^{\circ} 50'$ , he was obliged to relinquish his object and to return home. A second attempt in the following year was equally unsuccessful. In the year 1614, another voyage was undertaken, in which Baffin and Fotherby were employed; and Fotherby made a second attempt in the following year; but their progress was obstructed by the ice. This country and the adjoining seas have since been frequently resorted to by ships employed in the whale fishery; but its situation was never accurately ascertained till Captain Phipps (now Lord Malgrave) undertook a voyage by order of his majesty George III. in the year 1773. He found that the land, which was formerly supposed to extend as far as  $82^{\circ}$  N. lat., terminated with the "Seven Islands," the most northerly point of which does not exceed  $80^{\circ} 30'$  N. lat. He observed other lands lying eastward at a considerable distance; but Spitzbergen was found to be encompassed by water and in no part of it to be contiguous to the continent of Asia. He explored, with a degree of resolution and perseverance that did honour to himself and his associates in this expedition, the northern and western coasts, though he was prevented by the ice from advancing so far northwards as he wished; and he ascertained by accurate observation the longitudes and latitudes of several points, capes, and bays, which he visited. On his approach to the

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land he picked up a piece of drift wood, which was found to be fir, and not worm-eaten; and upon standing close in with the land, the coast appeared to be neither habitable nor accessible; it was formed by high, barren, black rocks, without the least marks of vegetation; in many places bare and pointed, in other parts covered with snow, appearing even above the clouds; the vallies between the high hills were filled with snow or ice. "This prospect," he says, in his "Journal," printed in 1774, "would have suggested the idea of perpetual winter, had not the mildness of the weather, the smooth water, bright sun-shine, and constant day-light, given a cheerfulness and novelty to the whole of this striking and romantic scene." The current on this coast was found, both by the common and Bouguer's log, to run north half a knot an hour. The height of one mountain, above the level of the sea, was found by measurement with the megameter, to be 15,035 feet, but by M. de Luc's calculation from observations with the barometer it was found to be 1588.

Among the harbours in which captain Phipps anchored, we may mention a small bay to the southward of Magdalena Hook and Hamburgher's bay; the former in N. lat. 79° 34', the same as Fotherby observed it to be in 1614: the high-water in this bay full and change at half an hour past one, or with a S.S.W. moon, which agrees exactly with Bassin's observation in 1613, the flood coming from the southward. Another anchoring place was Vogel Sang, N. lat. 79° 50'. E. long. 10° 2' 30"; the north easternmost point being the Cloven cliff, 79° 53'. E. long. 9° 59' 30", a bare rock so called from the resemblance of its top to a cloven hoof, which appearance it has always exhibited, having been so named by some of the first Dutch navigators who frequented these seas. It is also nearly perpendicular, so that it is never disguised by snow, and on these accounts it is one of the most remarkable points on the coast. The southernmost land is a high bluff point, called by the Dutch Vogel Sang. This sound, though open to the northward, is not liable to any inconvenience from that circumstance, the main body of ice lying so near as to prevent any great sea; nor are ships in any danger from the loose ice setting in, as this road communicates with several others formed by different islands, between all which there are safe passages. To all the sounds and harbours formed by this knot of islands the old English navigators had given the general name of Fair Haven, of which Fotherby took a *plat* in 1614. In this situation Hackluyt's Head-land was found to be in N. lat. 79° 47'. E. long. 9° 11' 30". The tide rose about four feet, and flowed at half an hour after one, full and change. The harbour of Smeerenberg, distant about 11 miles, N. lat. 79° 44'. E. long. 9° 50' 45", has good anchorage in 13 fathom, sandy bottom, not far from the shore; and it is well sheltered from all winds. The island close to the place where our navigators lay is called Amsterdam island, the westernmost point of which is Hackluyt's Head-land; here the Dutch formerly used to boil their whale-oil, and the remains of some conveniences erected by them for that purpose are still visible. They once attempted to make an establishment, and left some people to winter here, who all perished. Nevertheless, as they seem to have died not through the intensity of the cold, but in consequence of being attacked by the scurvy, and as others, both English and Russian sailors, have wintered here, a colony might be settled in this country, if such an establishment were likely to answer any good purpose. The Dutch ships still resort to this place for the latter season of the whale fishery. The stone found in this country was chiefly a kind of marble, which dissolved easily in the marine acid. But our navigators perceived no marks

of minerals of any kind, nor the least appearance of present, or remains of former volcanos. Neither did they meet with insects or any species of reptiles; not even the common earth-worm. They saw no springs, or rivers; the water, which was found in great plenty, being altogether produced by the melting of the snow from the mountains. During their stay in these latitudes, they had no thunder or lightning. The sky was in general loaded with hard white clouds; so that neither the sun nor the horizon was wholly free from them even in the clearest weather. They could always perceive when they approached the ice, long before they saw it, by a light appearance near the horizon, which the pilots called the "blink of the ice." (See BLINK.) One of the most remarkable phenomena which this country exhibited was the "iceberg." (See ICEBERG.) Of the animals and plants of Spitzbergen, captain Phipps has given an account in the appendix to his Journal. The animals are the arctic walrus, the common seal, the arctic fox, the polar bear, the reindeer, the common whale, the fin fish; and the birds the eider-duck, the puffin, the alca alle, the fulmar, the *Columbus grylle* and *troile*, the northern diver, the *larus rissa*, arctic gull, and *larus eburneus*, the greater tern, the greater brambling, the sea-snail, the coal-fish, the prawn, the cancer-boreas, or singular species of crab, and cancer nojax, not before described, and also cancer ampulla, and cancer pulex; several species of vermes, and shell-fish. Among the plants are a small species of *agrostis*, several species of *saxifraga*, of *bryum*, of *cochlearia*, and of lichen.

GREENLAND, a town of America, in Rockingham county, New Hampshire, near the sea, five miles southerly from Portsmouth, incorporated in 1713, and containing 548 inhabitants.

GREENLAND Fishery. See WHALE FISHERY.

GREENLAND Company. A joint flock of 40,000*l.* was by statute to be raised by subscribers, who were incorporated for fourteen years from the first of October 1693, and the company to use the trade of catching whales, &c. into and from Greenland, and the Greenland seas; they may make bye-laws for government, and of the persons employed in their ships, &c. (Stat. 4 and 5 W. III. cap. 17.) This company was farther encouraged by parliament in 1696; but partly by unskillful management, and partly by real losses, it was under a necessity of entirely breaking up, before the expiration of the term assigned to it, ending in 1707. But any person who will adventure to Greenland for whale-fishing, shall have all privileges granted to the Greenland company, by 1 Anne, cap. 16 and thus the trade was again laid open. Any subjects may import whale-fins, oil, &c. of fish caught in the Greenland seas, without paying any customs, &c. stat. 10 Geo. I. cap. 16. And ships employed in the Greenland fishery are to be of such burden, provided with boats, so many men, fishing-lines, harping-irons, &c. and be licensed to proceed; and on their return shall be paid 20*s.* per ton bounty, for whale-fins, &c. imported. 6 Geo. II. cap. 33. See WHALE FISHERY.

GREENLAW, in *Geography*, a town of Scotland, which, though the county-town of Berwickshire, is an inconsiderable place, pleasantly situated in a plain, lashed by the Blackader or Blackadder. The acclivities of the neighbouring eminences are tolerably cultivated. In its vicinity, about midway between Greenlaw and Kelso, on a rising ground, is Herne castle, which commands a view of the greatest part of the Merse and Roxburghshire, and was celebrated during the contentions on the border. It was a noted place of defence, often besieged by the English, and demolished

## GREENOCK.

lished by Cromwell. It is distant 37 miles S.E. from Edinburgh, and contains 1270 inhabitants.

GREENOCK, the principal sea-port town on the firth of Clyde, situated on the fourth bank of the river, about 2½ miles below the city of Glasgow. The town of Greenock is pretty well situated for commercial purposes, but in other respects it is neither pleasant nor so circumstanced as to afford the prospect of any great increase either of extent or population. Indeed the great number of young men, who, from habits of imitation as in other sea port towns, early attach themselves to a seafaring life, must present of itself a great obstacle to the latter. The town of Greenock is held under and is entirely surrounded by the lands of sir John Stewart of Blackhall, bart., who is feudal superior, and no purchase or acquisition of ground, either for the purposes of extension or improvement, can be had from any other person. This must of itself render extension a matter of more difficulty than where there are many landed proprietors, the lands of some of whom, from the common casualties and vicissitudes of human affairs, must be occasionally in the market.

The harbour of Greenock is divided into two compartments, and is entirely surrounded by well-built and commodious quays of freestone. The entrance is narrow, and in the centre opposite to the end of the mid quay, which serves as the division of the harbours. The eastern harbour is shallow, and is therefore mostly frequented by coasting vessels, herring busses, fishing boats, and other small craft. The west harbour, being considerably deeper, is the general resort of West Indian, American traders, and other vessels of greater burthen. In the west harbour is a very capital dry or graving dock, with flood gates to exclude the water, and capable of containing two large ships at the same time. It has been long in contemplation to improve the harbour of Greenock by the erection of wet docks, similar to those of London, Liverpool, Hull, and Leith, but probably from the difficulty of engaging the joint consent of the numerous interests concerned, and other causes, no steps have been hitherto taken for carrying this scheme into effect. The principal deficiency of the harbour of Greenock, exclusive of the ships bottoms taking the ground every ebb tide, arises from want of water, there being never more than seventeen or eighteen feet in the harbour, even at spring tides. Hence large vessels are obliged to discharge part of their cargoes into lighters in the roads before they can come into the harbour at all. This is of less consequence where the cargo is to be brought to Glasgow, if the weather be mild, but it is very inconvenient and expensive when the cargo is to be landed, and when the weather is boisterous. The whole rise of the tide at Greenock is only about twelve feet, whereas at Liverpool it is thirty-six and at Bristol forty-two. This also forms an additional disadvantage to the harbour of Greenock, and presents a very great obstacle to every plan of artificial improvement. With all these disadvantages, however, it has many advantages over the neighbouring harbour of port Glasgow, situated about three miles farther up the river. The chief obstacle to vessels of great burthen making any of these ports, is an immense bank of sand, accumulated for many ages in this *embouchure* of the Clyde by the current of the river, and which is sensibly though slowly increasing. Indeed nearly opposite to port Glasgow, this bank is entirely uncovered for miles at low water. Notwithstanding these natural disadvantages, the favourable situation of the Clyde for maritime intercourse with every part of the western hemisphere and the south of Europe, the great coasting trade with the western parts of England and Wales,

and with Ireland, and the extensive herring fishery, has raised Greenock to a high rank among the commercial ports of Britain, and has been productive of the acquisition of splendid fortunes to many of the principal inhabitants. As Greenock is not the seat of any staple manufactory, this carrying trade is her chief, and indeed may be fairly called her only support. During the American war, when the carrying trade was entirely suspended in some channels, and greatly impeded in all the others, a number of ship-owners fitted out their vessels as privateers, but in general these speculations were not productive of gain to the adventurers, and in some instances with serious loss. In the recent wars no attempts at privateering have been made.

The town of Greenock is governed by two magistrates, elected annually, and a council; besides whom, the baron baillie, nominated by the superior, also possesses a jurisdiction. The sheriff court of the county of Renfrew is held at Paisley, to which the inhabitants of Greenock are amenable, the same as the rest of the county.

In the external appearance of Greenock there is little elegance or splendour to be seen. In the centre of the town there is a small square, immediately fronting the mid-quay, which divides the harbour. In this square is a very handsome church of modern architecture. The other buildings are the inns, of which the chief, recently built upon a handsome scheme, like that of Glasgow, is a very spacious, and even splendid house. There is also a small neat theatre, the private property of Mr. Stephen Kemble, the manager, and some dancing-halls for the occasional recreation of the inhabitants and strangers, of whom, from the maritime situation, there is, at certain seasons, particularly at the arrivals of the West India fleets, a considerable influx.

The scenery of the Clyde around Greenock is picturesque and sublime. The river is about seven miles broad to the opposite shore, where the village of Helensburg is erected upon the property of sir James Colquhoun of Lufs, bart. This village is built in a very pleasant situation, upon a fine bay, formed by two projecting promontories, *viz.* by the hill of Ardmore, on the east, and by Roseneath, the property, and one of the splendid residences of the duke of Argyle, on the west. Beyond this, to the westward, appear the lowering mountains of Argyleshire, between which is the vast arm of the sea, Lochlong, which is twenty-four miles in length, and in some places said to be unfathomably deep. About two miles to the west is a small village, called Gourock, situated on a very fine deep bay, well sheltered by projecting head-lands, with a very good bottom for anchorage. It is the opinion of most professional men, whether engineers or seamen, that this situation affords by far the greatest number of natural advantages for a large and commodious sea-port upon the Clyde; and it is almost singular that Greenock should have risen to its present commercial importance, whilst Gourock, situated within less than two miles, and possessing every superiority of physical advantage, should have remained an insignificant village. However this may have originated, too much capital has now been expended upon Greenock and Port Glasgow, to leave the smallest room to suppose that they will be in any respect rivalled by a village which possesses nothing but natural situation to recommend it. On the road from Greenock to Gourock are many very fine villas, belonging to the opulent merchants of Greenock. At both Greenock and Gourock are extensive rope-works, belonging to the same company of proprietors. A little below Gourock is the Clough light-house, a very high and well-built tower, lighted by reflectors, for the safety of vessels coming up, or going down the channel during the night. Some miles below

this is the island of Bute, belonging chiefly to the nobleman to whom it gives the title of marquis. Bute is about seven miles long, and generally level and fertile. Mount-Stewart-castle, the residence of the noble proprietor, is situated near the middle of the island, on the south side, and is a superb and delightful place. Of the other proprietors, lord Bannatine, one of the Scottish judges, is the most conspicuous. The chief, and, indeed, almost only town on the island, is Rothfay, from which his royal highness the prince of Wales derives one of his Scottish titles, is a handsome, clean, small town, and has a considerable cotton mill and manufactory by it, belonging to a company of manufacturers in Glasgow. There are also the ruins of an old castle, which appears to have been of great extent, and once belonged to the royal family of Scotland. The inhabitants of Rothfay are chiefly sea-faring people, and employ themselves much in the herring fishery during the season. Large quantities of fine cod-fish are also caught off the coasts of Bute, Arran, and Argyshire, with which the markets of the west of Scotland are supplied, generally at a rate not exceeding two-pence *per* pound of 22½ ounces. Contiguous to Bute is a small island, called Inch Marnock, which is level and cultivated. It is the residence only of those employed in its cultivation. The island of Arran is nearly thirty miles in length, and is very mountainous. The highest hill, called Goatfield, is seen from a great distance. The island of Arran is the property of the duke of Hamilton, who is earl of Arran, who has a fine house, called Brodie's castle, on the island, where his family sometimes reside, especially during the season for shooting grouse or black game. Arran used to be much noted for a smuggling trade, both in contraband articles brought by the seamen employed in the vessels trading to the Clyde, and also in the distillation of whisky. The vigilance of the revenue cruisers in the Clyde has, in a great measure, checked the former, and that of the excise officers the latter. On Arran are found a number of fine stones, and it is sometimes visited by lapidaries, during the summer, for the purpose of searching for them, or of purchasing those occasionally picked up by the natives. On the island are only two small towns or villages, *viz.* Brodie's and Lamalisk, the latter of which, being defended from the south winds by an island in the mouth of the bay, is resorted to as a shelter in stormy weather by the ships and vessels navigating the frith of Clyde.

Besides those already mentioned, there are a few smaller islands in the frith, *viz.* the Cumbræ, which are two small islands lying pretty close to the southern shore, near the Renfrewshire coast, opposite to the village of Largs, about 16 miles below Greenock. The larger island is about two miles long, and on it is a very neat village, called Milport, chiefly inhabited by fishermen and seamen's families. The lesser island is a mere rock, where a few persons reside, who take charge of the light-house, and sometimes persons in a state of insanity are boarded here by their relatives, on account of the purity of the air, and the retirement of the situation. Farther down, and near the Ayrshire coast, is the stupendous rock, or crag of Ailfa, from which the proprietor, the earl of Cassius, derives his British title. Ailfa is a high abrupt and barren rock, totally uninhabited, and covered by myriads of sea-fowl, in search of which it is sometimes visited. Of the general trade of the Clyde notice has already been taken under the article GLASGOW.

GREENORE POINT, a cape of Ireland, in the county of Wexford, in the Irish sea. N. lat. 52° 10'. W. long. 6° 18' from Greenwich.

GREENSBORO, a post-town of America, in West Chester county, New York: 204 miles from Washington.

GREENSBOROUGH, a post-town and chief town of Greene county in Georgia, 30 miles from Lexington: containing 25 houses, a court-house, gaol, and Presbyterian meeting-house. Lands are appropriated for the establishment of an academy in this town.—Also, a neat township in Orleans county, in Vermont, containing 280 inhabitants.

GREENSBURG, a post-town and capital of Westmoreland county, in Pennsylvania, situated on a branch of Sewickly creek, which empties into Youghogony river. It contains 100 dwelling houses, a German Calvinist church, a brick court house, a stone gaol, 270 miles W. by N. from Philadelphia—Also, a post-town in Green county, Kentucky; 875 miles W. by S. from Washington.

GREENSVILLE, a county of Virginia, encompassed by Brunswick, Southampton, and Sussex counties, on the N. W. and E. and by N. Carolina on the S. It is about 24 miles long, and 20 broad, and contains 2611 free inhabitants, and 4116 slaves.

GREENVILLE, Sir RICHARD, in *Biography*, a gallant naval officer, son of Sir Roger, of an ancient family, in the west of England, was born about 1540. At the age of sixteen he obtained leave from queen Elizabeth, with others of his young countrymen, to serve in the imperial army in Hungary, against the Turks. Upon his return, he engaged with the troops employed for the reduction of Ireland, where he displayed so much courage and prudence, as to obtain the appointment of sheriff of the city of Cork. He sat in parliament in 1571, as knight of the shire for the county of Cornwall. He was afterwards high sheriff of the county, and received the honour of knighthood. Notwithstanding his civil employments, his attention was chiefly fixed upon plans of foreign discovery and settlement, proposed by his relation Sir Walter Raleigh. When the patents were made out for the purpose, Sir Richard obtained the command of a squadron fitted out for the purpose, consisting of seven in all vessels. With these he sailed in the spring of 1585, and reaching the coast of Florida in June, he left there a colony of one hundred men, and then sailed homewards. He made other voyages, but when the nation was threatened with the dangers of a Spanish invasion, he was appointed one of a council of war, to concert means of defence, and received the queen's commands not to quit the county of Cornwall, which prevented him from executing his intentions of making another voyage to the American coast. In 1591 he was appointed vice-admiral of a squadron, fitted out for the purpose of intercepting a rich Spanish fleet from the West Indies. The fleet, when it appeared, was convoyed by a very superior force, and Greenville was urged to tack about, but he preferred, and no doubt his sailors agreed with him, taking chance of breaking through the enemy's fleet, which almost immediately surrounded him. The Spanish admiral, with four other ships, began a close attack at three in the afternoon; the engagement lasted till break of day next morning, during which the Spaniards, notwithstanding their vast superiority, were driven off sixteen times. At length the greater part of the English crew being either killed or wounded, and the ship reduced to a wreck, so hope of escape remained. The brave commander had been wounded at the beginning of the action, but he caused his wounds to be dressed on deck, and refused to go down into the hold, and in that state he was shot through the body. He was now taken to the cabin, and while in the act of being dressed, the surgeon was killed by his side. The admiral still determined to hold out, wishing rather to sink the ship than surrender, but the offers of quarter from the Spaniards induced the men to yield. Sir Richard was taken on board the Spanish ship, and languish-

ably treated, but he died of his wounds in less than three days. His last words shew the temper of the hero, better than any eulogium that could be formed for him; they were spoken in the Spanish language, "Here die I, Richard Greenville, with a joyful and quiet mind; for that I have ended my life as a true soldier ought to do, fighting for his country, queen, religion, and honour; my soul departing from this body, leaving behind the lasting fame, of having behaved as every valiant soldier is in duty bound to do." This noble minded man has been blamed for rashness; but excess of bravery, if such it may be denominated, in a British seaman meets with a ready pardon, and such examples as Greenville and a Nelson, though not always to be justified on the score of prudence, have effected more advantages for this sea-girt island, than can be well described. *Biog. Brit.*

**GREENVILLE**, *Sir BEVIL*, grandson of the preceding, was born in the year 1596. He was educated at Exeter college, Oxford, under the celebrated D. Prideaux, where he acquired a large stock of knowledge, and an ardent attachment to the established religion of his country. When he came to his estate he distinguished himself as a most respectable country gentleman, and sat, very often, in parliament, as knight of the shire for the county of Cornwall, and burgess of Launceston. In 1638, he attended the king with a troop of horse, raised at his own expence, in an expedition to Scotland. For this service he received at the hands of his sovereign the honour of knighthood. He distinguished himself during the civil wars, and had a command in the battle of Stratton, gained by Hopton against the earl of Stamford, in May 1643. He was present, and made a considerable stand in other engagements, particularly in that which was fought at Lansdown, near Bath, in which the parliament forces were commanded by sir William Waller. In this action sir Bevil, at the head of his Cornishmen, received a fatal blow with a pole-ax. His body was afterwards found, surrounded by those of his officers; and it was observed, to the honour of the gentlemen of England, that there were more officers and gentry, than common men, slain on the king's side. Sir Bevil was extremely lamented: his character was drawn by lord Clarendon: "That which would have clouded any victory, was the death of sir Bevil Greenville. He was, indeed, an excellent person, whose activity, interest, and reputation was the foundation of what had been done in Cornwall, and his temper and affection for public, that no accident which happened could make any impression on him; and his example kept others from taking any thing ill, or at least seeming to do so: in a word, a brighter courage and gentler disposition were never married together, to make the most cheerful and innocent conversation." A monument was erected to his memory on the spot on which he fell. *Biog. Brit.*

**GREENVILLE**, in *Geography*, a county in Washington district, South Carolina; situated in the N.W. corner of the state; containing 11,504 inhabitants, of whom 1,439 are slaves. This county is mountainous and hilly; but it is well watered, and the climate is pleasant and healthy.—Also, a post-town of South Carolina, and chief town of Cheraws district; situated on the W. side of Great Pedee river, in Darlington county. It contains about 30 houses, a court-house, gaol, and academy; 55 miles E.N.E. from Camden.—Also, a post-town and capital of Pitt county, North Carolina, on the S. bank of Tar river, distant 23 miles from Washington, and containing about 50 houses, a court-house, a gaol, and a seminary, called the Pitt academy.—Also, a post-town of Mecklenburg county, Kentucky; 766 miles W. by S from Washington.—Also, a post-town in Jefferson county, Missi-

ssippi territory; 1217 miles from Washington.—Also, a small post-town in Green county, in the state of Tennessee, situated on the W. side of the north-easternmost branch of Nolachucky river, about six miles N. by E. of Greenville college; 653 miles S.W. of Philadelphia.—Also, a fort and settlement in the state of Ohio, on the S. side of a north-western branch of the Great Miami, six miles N.W. of fort Jefferson, on the same branch, about 23 miles S.E. of fort Recovery. It has bastions at each angle, and is capable of accommodating 2000 men.

**GREENVILLE Bay**, or *La Bay*, a town and port of entry on the E. or windward side of the island of Grenada. It has about 60 dwelling-houses, a church, and several rich stores of Indian and European goods, and plantation utensils. Its situation is low and rather unhealthy.

**GREENVILLE College**, a college in Green county, in Tennessee, founded in 1794, by the first act of the first assembly of the south-western territory. It is situated between two small northern branches of Nolachucky river, not far from *Greenville*, (which see) the county town. Its local situation conduces very much to its utility, as it is retired, healthy, cheap, and near public roads in every direction. It is under the management of 14 trustees, and possesses a library of between one and two thousand volumes, and philosophical apparatus, and a convenient building.

**GREENWICH**, a market-town and parish in the hundred of Blackheath, and county of Kent, England, is situated on the banks of the Thames, adjoining to Deptford, and 5½ miles distant from London. There are traces of a royal residence at Greenwich so early as the reign of Edward I., A.D. 1300. Henry IV. dated his will in 1408 from this manor, which was granted by Henry V. to Thomas duke of Exeter, after whose death it was conferred on Humphrey duke of Gloucester, uncle to Henry VI., who, in 1433, gave the duke licence to fortify and embattle his manor-house, and to make a park of 200 acres; under this grant the duke rebuilt the palace, and inclosed the park, in which he erected a moated tower. On the duke's death in 1447, the manor reverted to the crown; and was a favourite residence of Edward IV., who enlarged and finished the palace. Henry VII. spent much of his time at Greenwich, where his two sons, Henry and Edmund, were born. Henry VIII. made considerable additions to the buildings, and during his reign Greenwich became one of the principal scenes of that festivity for which his court was celebrated. Tournaments and revels were frequently held; and in 1513 the first masquerade ever seen in England was here introduced. Edward VI. kept his Christmas here in 1552, and died in this palace in July following. The queens, Mary and Elizabeth, were both born here, and the latter christened with peculiar state. She was particularly partial to this mansion, and made it her summer residence, passing the festive hours of that romantic period in various diversions and splendid exhibitions. This palace was frequently visited by James I. and Charles I.; was afterwards assigned by parliament to the Protector; and, after the restoration, again devolved, with the park and appendages, to the crown: when the king, finding the whole building in a ruinous state, ordered it to be pulled down, and commenced a magnificent palace of free-stone on its site, under the direction of Webb, the son-in-law of Inigo Jones, from whose papers the designs are said to have been made. One wing, however, was all that was completed, at the expence of 36,000*l.*, in which the king occasionally resided; but no further progress was made in the building either in that or the succeeding reign. Soon after the accession of William and Mary, a project was formed for providing an asylum for aged and disabled women;

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men; and their majesties having resolved to carry it into execution, sir Christopher Wren recommended that the unfinished palace at Greenwich should be completed and enlarged for this purpose. His advice being adopted, he contributed his time and abilities in the superintendance of the works for several years without any emolument. Such was the origin of Greenwich hospital, of which the foundation was laid June 3, 1696, and which has been gradually enlarged and improved, till it arrived at its present height of magnificence. The hospital is a splendid and extensive structure, principally built with Portland stone, and consists of four distinct quadrangular piles of buildings, distinguished by the names of the respective sovereigns, in whose reigns they were founded or built. The grand front opens on a terrace, skirting the southern bank of the Thames, and extends 865 feet in length, in the centre of which is a descent to the river, by a double flight of steps. The ground plan of the whole edifice forms nearly a square; of which king Charles's building occupies the north-west angle; queen Anne's, the north-east; king William's, the south-west; and queen Mary's, the south-east. The interval between the two former buildings forms a square 270 feet wide, in the middle of which is a statue of George II, sculptured by Rybrach, out of a single block of white marble, which weighed eleven tons, and was taken from the French by admiral sir George Rooke: this statue was given to the hospital by sir John Jennings, who was governor from 1720 to 1744. The space between the two latter buildings which include the hall and chapel, with their elegant domes, and the two colonnades, forms a lesser square, apparently terminated by the ranger's lodge in the park. The two squares are intersected by a spacious avenue, leading from the town through the hospital. The buildings which immediately front the Thames have a general correspondence in style and arrangement. The north and south fronts of each exhibit the appearance of a double pavilion, conjoined above by the continuation of an Attic order, with a balustrade, which surmounts the whole, but is separated below by an open portal: the centre of each pavilion displays an elegant pediment, supported by four Corinthian columns, and the sides a double pilaster of the same order. King Charles's building contains the apartments of the governor and lieutenant-governor, the council-room, and anti-chamber; with fourteen wards, wherein 300 pensioners may be accommodated. In the council-room are several portraits: in the anti-chamber two large sea-pieces, given to the hospital by Philip Harman, esq, representing the exploits of his ancestor captain Thomas Harman of the *Tyger* frigate, in the reign of Charles II; and a series of six small pieces, descriptive of the loss of the *Luxemburgh* galley, in the year 1727. Queen Anne's building contains several apartments for inferior officers, with twenty-four wards, for four hundred and thirty-seven pensioners. King William's building stands to the south-west of the great square, and comprises the great hall, vestibule, and dome, designed and erected by sir Christopher Wren, between the years 1698 and 1703. To the east of these adjoins a colonnade, three hundred and forty-seven feet in length, supported by Doric columns, and pilasters twenty feet in height. The great hall is one hundred and six feet in length, fifty-six in width, and fifty high: the ceiling and sides are covered with portraits and emblematical figures, executed by sir James Thornhill, for which he was paid at the rate of 3*l.* per square yard for the ceiling, and 1*l.* for the sides, amounting in the whole to 6685*l.* The west front of King William's building, which is of brick, was finished about 1725 by sir John Vanbrugh: the building contains eleven wards, wherein are five hundred and fifty-one beds. The foundation of

the eastern colonnade, which is similar to that on the west side, was laid in 1699; but the chapel, and the other parts of queen Mary's building which adjoin to it, were not finished till 1752. It corresponds with king William's, and is furnished with one thousand and ninety-two beds, in thirteen wards. The present chapel, one of the most elegant specimens of Grecian architecture in this kingdom, was erected from the classical designs of the late James Stuart, esq., better known, perhaps, by the appellation of "Athenian Stuart," which he acquired from the Attic elegance of his buildings, and his interesting publication on the antiquities of Athens. The chapel is one hundred and eleven feet in length, and fifty-two in width, and is capable of accommodating one thousand pensioners, nurses, and boys, exclusive of the seats for the directors and other officers. The portal consists of an architrave, frieze, and cornice, of statuary marble: the folding-doors are of mahogany, highly enriched by carving. The interior is finished in an elegant style; and is adorned with many appropriate paintings; the most distinguished of which is the altar-piece, executed by West, and representing the preservation of St. Paul, on the island of Melita; a subject peculiarly adapted to this establishment. Without the walls of the hospital stands the Infirmary, erected in 1763, after a design by Stuart: it forms an oblong quadrangle, one hundred and ninety-eight feet long, and one hundred and seventy-five broad; and consists of two stories for the reception respectively of those whose cases require surgical aid, and of those who are in need only of medical assistance. It contains sixty-four rooms, each is fitted up for the accommodation of four patients. It also includes a chapel, hall, kitchen, and apartments for the physician, surgeon, and apothecary; with hot and cold baths, and other necessary offices. The pensioners, who are the objects of this noble charity, must be seamen disabled by age, or maimed, either in the king's service, or in the merchant service, if the wounds were received in defending or taking any ship, or in fight against a pirate; foreigners who have served two years in the British navy, become entitled to the benefits of this institution in the same manner as natives. The widows of seamen are provided for, having the exclusive privilege of being nurses in the hospital. The number of pensioners is upwards of 2400, who are furnished with clothes, diet, and lodging, with a small allowance of pocket-money. The nurses are 144, each of whom receives eight pounds per annum as wages, with every necessary of life. The governors of the hospital are about 100, and consist of all the great officers of state, the archbishops, the lord chancellor, the judges, the master and five senior brethren of Trinity-house, the lord mayor, and three senior aldermen of London, with some of the principal officers of the hospital. The annual average expence of each pensioner, according to the report of the commissioners of naval enquiry, was estimated at 27*l.* 10*s.* 9*d.* per man; and of the nurses, 29*l.* 15*s.* 0*d.* each; the total annual expence being 69,266*l.* 5*s.* The funds of the establishment are principally derived from a duty of sixpence per month, paid by every mariner, either in the king's or merchant's service; the forfeited estates of the earl of Derwentwater; and various benefactions from different sovereigns, from parliament, and from private persons.

The old tower at Greenwich, built by duke Humphrey, temp. Henry VI. was pulled down in 1675, by order of Charles II., who founded on its site the present Royal Observatory, for the purpose of ascertaining the motions of the moon, and the places of the fixed stars, in order to facilitate the attempts to discover the longitude at sea.

Mr. Flamsteed, the first astronomer royal, began his observations

servations in September 1676, and did ample justice to his appointment, though walking in an almost untrodden path, and not having, till 1689, the advantage of a mural quadrant, and even then not such as is now in use, but one contrived by himself. He died in December 1719, and was succeeded by Dr. Halley, who fixed a transit instrument, and had a new mural quadrant of eight feet radius, constructed by Graham. On the death of Dr. Halley, in 1742, Dr. Bradley was appointed; in his time very valuable additions were made to the instruments at the observatory. Dr. Bradley, dying in 1762, was succeeded by Mr. Bliss, whose decease, in 1764, made room for the advancement of Dr. Maskelyne, the present astronomer royal, who has displayed eminent ability in his situation. Since his appointment, the observatory has been furnished with an excellent achromatic telescope, of forty-six inches, focal length, with a treble object glass, &c. by Dollond; and the whole astronomical apparatus has been greatly improved by Dollond, Nairne, and Arnold. The observations made by the astronomer royal have been, since 1767, published annually under the inspection of the Royal Society, who have the power of visiting the observatory every year, to see that the instruments are kept in proper order.

The church at Greenwich is dedicated to St. Alphage, archbishop of Canterbury, who is said to have been killed by the Danes on its site; it is one of the fifty new churches erected in the reign of queen Anne; the old church having become so ruinous by lapse of time, that the roof fell in about midnight, November 28, 1710. At the end of the town is the duke of Norfolk's college, for the maintenance of 20 decayed housekeepers. Here is also a hospital for 20 poor persons, founded by Mr. Lambarde, author of the "Perambulation of Kent," and called queen Elizabeth's college. There was a convent of friars at Greenwich, founded about the time of Edward IV. For many years here was a considerable powder magazine, which, after repeated application to parliament by the inhabitants, was removed to Purfleet in Essex, in 1760.

The population of Greenwich, as returned under the late act, was 14,339; the number of houses 2,121; many of these are handsome buildings; the streets are irregular, and the whole town is intersected by the hospital and its precincts. Fairs for three days are held at Easter and Whitfuntide; and well supplied markets every Wednesday and Saturday. Lysons's Environs of London, vol. iv. Beauties of England and Wales, vol. vii.

GREENWICH, a township of America, in Hampshire county, Massachusetts, incorporated in 1754, and containing 1,460 inhabitants; 20 miles E from Northampton.—Also, a township in Gloucester county, New Jersey, on the E. bank of Delaware river, opposite to Fort Mifflin; 6 miles S. E. of Philadelphia.—Also, a township in Suffolk county, New Jersey, on the E. side of Delaware river, in a mountainous country, 31 miles S. W. of Newton; it contained, in 1790, 2,035 inhabitants.—Also, a town in Cumberland county, New Jersey, on the N. W. bank of Co-hanzy creek, about 3 miles from its mouth, in Delaware bay, containing about 80 houses and a Friends' meeting-house; 66 miles S. by W. from Philadelphia.—Also, a maritime and post-town in Fairfield county, Connecticut, 40 miles E. of New York, and containing 3,147 inhabitants.—Also, a town in Washington county, New York, on the E. bank of Hudson's river. At the saw-mills of this town much business is done.

GREENWICH, East, a post-town, and the chief township in Kent county, Rhode island, distant 16 miles S. from Providence, and containing 1,775 inhabitants. It includes

a meeting-house and a handsome court-house; and though its commerce is much reduced, it derives advantage from its fisheries, and sends some vessels to the West Indies. It is situated on the N. W. part of Narraganset bay. It is noted for its good cyder, and formerly raised tobacco for exportation.

GREENWOOD, a township in Cumberland county, Pennsylvania, having 724 inhabitants.—Also, a township in Missin county, in the same state, containing 969 inhabitants.

GREEN WOODS, a large forest of stately pines in Litchfield county, Connecticut, covering part of that county, and clothed in a green bearded moss, which gives to the whole a gloomy, wild, and whimsical appearance.

GREES, a river of Ireland, in the county of Kildare, which flows by the pretty town of Ballitore, and joins the Barrow; 6 miles S. from Athy.

GREESA, a town in Algiers; 30 miles E. S. E. of Tiffesh.

GREGARIOUS BIRDS, are such as do not live solitarily, but associate in flights or coveys, a great many together in company.

GREGARIOUS, in *Geology*, is applied to such reliquia or extraneous fossils, found imbedded in the strata, as are congregated a great number of the same species together, which very commonly is the case, particularly in calcareous rocks.

GREGGIA, in *Botany*, so named by the late Dr. Solander, in compliment to Mr. John Greg, a gentleman long resident in Dominica, the correspondent of Ellis, Garden, and other naturalists of his day. He sent many plants to Kew and other collections, and returned to England about the year 1784, dying some years afterwards, at his seat near Hampton Court—Gærtn. t. 33. (*Myrtus Gregii*; Swartz. Ind. Occ. 896. Ait. Hort. Kew. vol. ii. 159. Mart. Mill. Dict. v. iii.) See MYRTUS.

GREGOIE, or GREBOU, in *Geography*, a small island of Africa, in the river Jacquin, about a league from the sea, on the Gold Coast, where the European nations have factories.

GREGORIAN CALENDAR. See CALENDAR.

GREGORIAN Chant. See CHANT.

GREGORIAN Code. See CODE.

GREGORIAN Epocha, is the epocha, or time, whence the Gregorian calendar or computation took place. The year 1810 is the 228th year of the Gregorian epocha.

GREGORIAN Notes, in *Ecclesiastical Music*. In the Romish missals, breviaries, antiphonaries, and graduals, only four lines are used in the notation of the chants; with two clefs, the base and tenor, or those of F and C, which are removable; and two kinds of notes, the square and the lozenge; the first for long syllables, and the second for short. In some modern French missals a third species of note is used, generally at a close; this is square with a tail added to it, and is of longer duration than either of the other two. However, the Italians seldom use any other than square notes in their canto fermo, nor did the French, in their more ancient books.

These characters are not supposed to have been invented by St. Gregory, nor were they in use till many ages after his time; but since their invention, having been appropriated chiefly to the purpose of writing ecclesiastical chants in the antiphonary of that pontiff, they obtained the appellation of Gregorian notes.

GREGORIAN Year. See YEAR.

GREGORIO de Puerto Viejo, in *Geography*, a district



and town of South America, in the audience of Quito, and jurisdiction of Guayaquil.

GREGORIO, *St.* a town of Naples, in Principato Citra; 8 miles N. W. of Cangianno.

ST. GREGORIO *de Abo*, a town of New Mexico; 110 miles S. of Santa Fé.

GREGORIUS, in *Ichthyology*. See SALMO *lavaretus*.

GREGORY I. in *Biography*, pope, furnished the Great, and also dignified with the title of Saint, was a native of Rome, and born about 544 or 5. He was descended from one of the most illustrious families in that city, and was educated in a manner suitable to his rank. His proficiency in literary pursuits answered the most sanguine expectations of his friends; it was said that none in Rome excelled him in grammar, rhetoric, and logic. Having left the usual routine of school learning, in the course of which he had imbibed sentiments of deep piety, as well as the elementary principles of knowledge, he paid particular attention to the study of jurisprudence, which was necessary to persons who filled those stations, to which he was entitled by his birth. When he came under public notice, he discovered such abilities, integrity, and prudence, in the exercise of the different senatorial employments, that the younger Justin, who was emperor, appointed him to the honourable post of governor of Rome. In this office he acquitted himself to the satisfaction of the emperor, of the senate, and of the people. At the death of his father, he became possessed of immense wealth, and being, probably from some disappointments, disgusted with the world, he determined to embrace the religious life. He devoted the greater part of his property to the foundation of religious houses, and to charitable purposes. He founded six monasteries in Sicily, and one at Rome in his father's house, dedicated to St. Andrew, over which he constituted Valentius abbot, whom he had selected for that post from a country monastery, and to whose discipline he submitted himself. From the time of his taking the vows, he abandoned himself to meditation, devotion, and the most rigorous abstinence. He was, however, in the year 579 taken from his retreat, ordained deacon, and sent nuncio from the pope to the imperial court: the object of this mission was to apply for relief in behalf of the inhabitants of Italy, against the ravages of the Lombards. So ably did he conduct the business, that the emperor was entirely satisfied, and Gregory became one of his principal favourites: he was equally beloved by the principal courtiers, and even by the bishops, notwithstanding the jealousy which they usually entertained of a pope's nuncio. While he was at Constantinople, he had a dispute with the patriarch Eutychius, on the question, Whether, after the resurrection, the bodies of the righteous would or would not be palpable. The argument was carried on in the presence of the emperor Tiberius; Gregory maintained the affirmative side of the question, to which the emperor gave his decided sanction, at the same time, he ordered the patriarch to acquiesce in the judgment, and condemned to the flames a treatise of that prelate in support of the negative side of the question. In 583 Gregory was recalled to Rome, and appointed secretary to pope Pelagius, until he obtained permission to retire to his monastery. He was chosen abbot; and in that office exacted of his monks as strict an observance of rigorous abstinence and discipline, as he practised himself. After a short exercise of the monastic virtues, he was dragged from the cloister to the papal throne, by the unanimous voice of the clergy, the senate, and the people. He alone resisted his own elevation; and his humble petition, that the emperor would be pleased to reject the choice of the Romans, could only serve to exalt his character in

the eyes of the emperor and the public, and he not only confirmed the wishes of the people, but congratulated the Romans on the choice which they had made. When the mandate was proclaimed, Gregory solicited the aid of some friendly merchants to convey him in a basket beyond the gates of Rome, and he concealed himself a few days in the mountains, and among the woods, where he believed, or affected to believe, that he should be safe from discovery. Notwithstanding this precaution, he was in a few days found in a cave, and brought back in triumph by the people, who would not abandon their charge, till they had taken him to the church of St. Peter, where he was instantly ordained. The pontificate of Gregory the Great, which lasted rather more than six years and a half, is reckoned one of the most flourishing periods of the church; his virtues, and even his failings, were happily suited to his station, and to the temper of the times. His first step was to satisfy the bishops of the chief sees, as to the orthodoxy of his faith. For this purpose, he wrote to the patriarchs of Constantinople, Alexandria, Antioch, and Jerusalem, declaring that he received the first four councils as the four books of the holy gospel; that he revered the fifth, and that he condemned the three chapters. In his rival, the patriarch of Constantinople, he condemned the Anti-christian title of universal bishop, which the successor of St. Peter was too haughty to concede, and too feeble to assume; and the ecclesiastical jurisdiction of Gregory was confined to the triple character of bishop of Rome, primate of Italy, and apostle of the West. He frequently ascended the pulpit, and kindled by his eloquence the congenial passions of his audience: the language of the prophecies of the Old Testament he interpreted and applied, and he took the opportunity of improving the present calamities of the people, by directing their hopes and anxieties to the invisible world. His precepts and example defined the model of the Roman liturgy; the distribution of the parishes, the calendar of festivals, the order of procession, the service of the priests and deacons, the variety and change of sacerdotal garments. Till almost the last period of his life, he officiated in the canon of the mass, which continued above three hours at a time. Gregory was no friend to heretics; he spared no pains to arm the civil and ecclesiastical power against the Donatists in Africa, and all who favoured them. At first, he was defeated in his wishes to destroy the harmony that subsisted between the Catholic and Donatist parties in that country: he contrived to introduce invidious distinctions, which by degrees renewed the animosities by which they had been formerly distracted, and terminated in the ultimate triumph of the Catholic, which was the strongest party. Notwithstanding the zeal of pope Gregory against the heretics, he was favourable to the Jews, and protected them against some violent Christians. In certain letters, which he wrote to the bishops who were for forcing them to embrace Christianity, he condemned persecution of all kinds in the strongest terms, though he enforced it in the instance of Christians, who ventured to differ from the Catholic creed. On his accession to the papal throne, a general relaxation of discipline, as well as of piety and morals, prevailed in the clerical orders: he immediately set about the correction of these evils with the utmost diligence and perseverance. While Gregory was enforcing reformation on the clergy, he set before them an example of the conduct which he prescribed. He was strictly attentive to the duties of piety: he was humble, mild, compassionate, hospitable, and disinterested, an enemy to all pomp, grandeur, and show, frequently abridging himself of the necessaries of life to relieve the indigent, and was most indefatigable in instructing his flock, both by preaching and writing. With

all his humility, however, Gregory was a most zealous assertor of the power and prerogatives which his predecessors had exercised, or at any time claimed. He would declare, and no one seemed to doubt the sincerity of his assertion, that he would rather lose his life, than suffer the fee of St. Peter to forfeit any of the privileges which it had ever enjoyed, or the prime apostle to be any ways injured, or robbed of his rights. In the year 595, the emperor issued an edict, forbidding any soldiers to quit the army, under the pretence of embracing a monastic life, till the time of their service was expired. The pope determined to remonstrate against the decree, being persuaded that the ecclesiastical road was more safe than any other to the attainment of a heavenly crown. For this and some other acts of interference, the emperor expressed his dissatisfaction with the steps taken by the pope, in strong and even abusive terms, and they proved the means of frustrating his application for a redress of grievances occasioned by the cruelty and avarice of the imperial officers. The king of the Lombards threatened to lay siege to Rome, in order that he might avenge himself of some circumstance that had happened contrary to his dignity, but Gregory made friends with his favourites, who had themselves embraced the Catholic faith, and by their intercessions the prince was induced to draw off his troops. About this time the patriarch of Constantinople assumed the title of "Universal Patriarch," a measure which alarmed Gregory, who made every exertion to prevent him from making good his claims. All his entreaties were vain, the patriarch established his title, and entailed it on his successors. When Gregory was informed of this he renounced the patriarch's communion, and condemned his conduct on the occasion as vain, ambitious, profane, impious, execrable, anti-christian, blasphemous, infernal, and diabolical. In the year 595, Agilulph, king of the Lombards, broke into the imperial territories, laying waste the Roman dukedom of Campania, and carrying away the inhabitants into captivity. On this occasion Gregory exercised the most unbounded charity, in relieving the poor, and redeeming great numbers of prisoners, not only applying the revenues of his see to those benevolent purposes, but large sums which he obtained by his application to the bishops, and the great men who were his friends, both in the East and West. Under his reign the Arians of Italy and Spain were reconciled to the Catholic church, and the conquest of Britain reflects less glory on the name of Caesar than on that of Gregory I. Instead of six legions, forty monks were embarked for that distant island, and the postiff lamented the austere duties which forbade him to partake the perils of their spiritual warfare. In less than two years he could announce to the archbishop of Alexandria, that they had baptized the king of Kent with ten thousand of his Anglo-Saxons, and the Roman missionaries, like those of the primitive church, were armed only with spiritual and supernatural powers. The credulity or the prudence of Gregory was always disposed to confirm the truths of religion by visions and pretended miracles, and he accordingly acquired a high reputation with his own and succeeding ages. The patriarch of Constantinople dying, he was succeeded by Cyriacus, whose faith was deemed orthodox by the pope, but who persisted in claiming the title "Universal Patriarch." Gregory still resisted, and in the course of the correspondence which he maintained with the patriarchs of Antioch and Alexandria to interest them on his side of the dispute; the last mentioned prelate gave him the title of "Universal Pope," in hopes thereby of terminating the difference between the contending parties. Gregory, however, rejected the title with great indignation, and by way

of contrast to the patriarch's conduct, he adopted the appellation of "Servant of Servants," which his successors have retained to this day, and affected to use it even when distinguished by the most scandalous exercise of pride and despotism. In the year 601, at the request of Augustine, the pope sent a fresh colony of monks into Britain, and with such directions to that apostle of the Anglo-Saxons, as he has been denominated, as have proved the means of introducing the grossest corruptions and superstitions into the system of Christianity established through his mission. During this same year Serenus, bishop of Marseilles, ordered all the images throughout his diocese to be cast out of the churches and destroyed: his conduct was not quite approved by Gregory, though he pretended to applaud Serenus's zeal, in not suffering any thing to be worshipped that is made with hands. Nevertheless, he condemned his casting them out of the churches and dashing them to pieces, as the effect of an inconsiderate and indiscreet zeal, observing, that "though images were not set up in the churches to be worshipped, yet they serve to instruct the ignorant: and it is one thing to adore an image, and another to learn from an image what is to be adored." During the year 602 a revolution took place at Constantinople, in consequence of the revolt of the army, at the instigation of Phocas, a centurion, who was proclaimed emperor, and obtained possession of the imperial city and throne. The first object of the new sovereign was to destroy the abdicated prince, with his six sons and a number of his relations and friends, and then he got himself acknowledged lawful emperor in all parts of the empire. On this occasion, Gregory expressed his utmost satisfaction and joy at the change that had taken place, without hinting that he felt any sorrow at the means by which it had been accomplished. He immediately wrote letters to the new emperor, congratulating him on his accession to the imperial crown, which he said was effected by a particular providence, to deliver the people from the oppressions under which they had so long groaned, and he even commended, flattered, and extolled the tyrant, for his justice, clemency, and piety, in the most fulsome terms. His object in this abject behaviour was that he might, by means of the influence of the emperor, defeat the attempt of the patriarch to assume the title of "Universal Bishop." This he plainly told to Leontia, the new empress, representing to her what blessings they might expect from St. Peter in heaven, provided they obliged the patriarch to relinquish the title, which the pope considered derogatory to the honour, dignity, and interests of his see. In this object he succeeded, for Phocas enacted a law, by which he prohibited the bishop of Constantinople from styling himself oecumenical or general patriarch, declaring that this title belonged to none but the bishop of ancient Rome. This was not the only instance in which Gregory condescended to flatter base and infamous characters: he shewed equal or even greater complaisance to Brunehaut, queen of France, who is described by Bayle as the most wicked woman upon earth, but as capable of winning over the clergy to her interest, because at the same time that she committed the most enormous crimes, she was excessively liberal to ecclesiastics, and founded temples and convents, not forgetting to sue very devoutly for relics to the holy father. In all the letters which the pope wrote to her, he treated her with the most abject flattery, declaring that no nation in the world was so happy as the French, since it merited such a queen, endowed with virtues and fine qualities of every kind. In the year 604, Gregory was attacked with a severe fit of the gout, a disorder to which he had been accustomed, and which rendered him incapable

of performing the duties of his high office. Ambassadors were sent to him from the queen of the Lombards, announcing the birth and baptism of her son: he was unable to write an answer to her majesty, with regard to some difficulties which she wished to have solved, but he returned by her ambassador, a complimentary note, containing commendations of her zeal for the Catholic faith, and with presents to the new-born prince, of a cross to wear at his neck, in which was enclosed a piece of the true cross, as he was pleased to affirm, together with the gospel, in a Persian box. This was one of the last acts of the pope. He died in the month of March 604. Such were the transactions of Gregory I. who has, for his talents and merits, been surnamed the Great. There was, however, a strange mixture of inconsistencies in his character. In some respects he discovered a sound and penetrating judgment, but in others the most shameful and superstitious weaknesses. He was no friend to secular and polite learning: he has even been accused of having destroyed the noble monuments of the ancient magnificence of the Romans, left travellers and foreigners, who came to visit Rome on religious motives, by paying undue attention to them, should neglect the holy places. This accusation does not stand on undeniable evidence. It is doubted by Gibbon and other well-informed historians. "The writings of Gregory," says Mr. Gibbon, "reveal the implacable aversion to the monuments of classic genius; and he points his severest censure against the profane learning of a bishop, who taught the art of grammar, studied the Latin poets, and pronounced with the same voice the praises of Jupiter and those of Christ. But the evidence of his destructive rage is doubtful and recent; the temple of peace, and the theatre of Marcellus, have been demolished by the slow operation of ages, and a formal proscription would have multiplied the copies of Virgil and Livy in the countries which were subject to the ecclesiastical dictator." Gregory invented new offices for the services of the church, and the sacraments, in which he prescribed a vast number of rites and ceremonies that were unknown before his time. He took great pains in reforming the psalmody of the church, instituting an academy of choiristers, whom he taught to chant, and for whose use he composed that music which goes by his name. He left more writings behind him than any other pope from the foundation of the see of Rome to the present period. These consist of twelve books of "Letters," amounting to upwards of eight hundred in number. "A comment on the book of Job," generally known by the name of "Gregory's Morals on Job." "A Pastoral," or a treatise on the duties of a pastor. This work was held in such veneration by the Gallican church, that all the bishops were obliged, by the canons of that church, to be thoroughly acquainted with it, and punctually to observe the rules contained in it. He was author also of "Homilies" on the prophet Ezekiel; and on the gospels, and of four books of "Dialogues." His works have been printed over and over again, in almost all forms, and at a number of different places on the continent, as Lyons, Paris, Rouen, Basil, Antwerp, Venice, and Rome. The best edition is that of Paris, in 1705, in four vols. folio. The charity and wealth of this pontiff have already been referred to: in the use of his abundant riches, he acted like a faithful steward of the church and poor. The voluminous accounts of his receipts and disbursements were kept above three hundred years in the Lateran as the model of Christian economy. On the four great festivals, he divided their quarterly allowance to the clergy, to his domesticities, to the monasteries, to the churches, the places of burial, the alms-houses, and the hospitals of Rome, and the rest of the diocese. On the first day of every month he distributed

to the poor, according to the season, their stated portion of corn, &c.; and his treasurers were continually summoned to satisfy in his name the extraordinary demands of indigence and merit. The distress of the sick and helpless, of strangers and pilgrims, was relieved by the bounty of each day and of every hour, nor would the pontiff indulge himself in a frugal repast till he had sent the dishes from his own table to some objects deserving of his compassion. The misery of the times had reduced the nobles and matrons of Rome to accept, without a blush, the benevolence of the church. Three thousand virgins received their food and raiment from the hand of their benefactor, and many bishops of Italy escaped from the barbarians to the hospitable abode of the Vatican. Gregory might justly be styled the father of his country, and such was the extreme sensibility of his conscience, that, for the death of a beggar, who had perished in the streets, he interdicted himself during several days from the exercise of sacerdotal functions. Moreri Gibbon. Lardner.

Ecclesiastical writers seem unanimous in allowing that it was the learned and active pope Gregory the Great, who collected the musical fragments of such ancient hymns and psalms as the first fathers of the church had approved, and recommended to the primitive Christians; and that he selected, methodized, and arranged them in the order which was long continued at Rome, and soon adopted by the chief part of the western church.

The anonymous author of his life, published by Canisius, speaks of this transaction in the following words: "This pontiff composed, arranged, and constituted the *Antiphonarium* and chants used in the morning and evening service." Fleury, in his *Hist. Eccl.* tom. vii. p. 150, gives a circumstantial account of the *Scola Cantorum*, instituted by St. Gregory. It subsisted 300 years after the death of that pontiff, which happened in 604, as we are informed by John Diaconus, author of his life. The original Antiphonarium of this pope was then subsisting; and the whip with which he used to threaten to scourge the boys; as well as the bed on which he reclined in the latter part of his life, when he visited the school in order to hear them practise. Two colleges were appropriated to these studies; one near the church of St. Peter, and one near that of St. John Lateran; both of which were endowed with lands.

It has been imagined that St. Gregory was rather a compiler than a composer of ecclesiastical chants, as music had been established in the church long before his pontificate; and John Diaconus, in his life, (lib. i. cap. 6.) calls his collection "Antiphonarium Centonem," the ground-work of which was the ancient Greek chant, upon the principles of which it was formed. This is the opinion of the Abbé Lebeuf, (*Traité Historique et Pratique sur le Chant Ecclésiastique*, chap. iii.) and of many others. The derivation is respectable; but if the Romans in the time of St. Ambrose had any music, it must have been composed upon the Greek system: all the arts at Rome, during the time of the emperors, were Greek, and chiefly cultivated by Greek artists; and we hear of no musical system in use among the Romans, or at least none is mentioned by their writers on the art, but that of the Greeks.

GREGORY II., pope, was a native of Rome, and educated from childhood, in the Lateran palace, under pope Sergius, who appointed him his sub-deacon, almoner, and librarian. He was afterwards raised to higher posts in the church, and was selected by pope Constatine, as the most learned man of his time, to accompany him when he went to Constantinople, in the year 710. In that city Gregory distinguished himself by answering certain difficulties proposed to him by the emperor Justinian, and solving his doubts with regard to some questions

to which, it should seem, he was much interested, though what those difficulties were we are not informed. Upon the death of Constantine, in 715, he was raised to the papal dignity, and almost immediately upon this event, the Lombards made an irruption into the imperial territories, and took by surprise the city of Cumæ. Gregory, in his quality of Holy Father, endeavoured to prevail on them to restore it, first by threatenings of the vengeance of heaven if they should prove so wicked as to retain it, and afterwards by the offer of a large sum of money, and the particular protection of St. Peter, provided they withdrew their troops, and abstained from all farther hostilities. Finding that they were equally deaf to the threatenings and promises of the pope, he applied for the assistance of the king of Naples, who, for a stipulated sum, undertook to recover the place, and succeeded in the enterprise. In the year 717, the emperor Theodosius, having resigned the imperial dignity, and retired to a monastery, Leo, the Haurian, was, by the senate and army, raised to the throne, on which occasion he wrote a letter to the pope, accompanied with a confession of faith, and also with promises to maintain the Catholic doctrine, as defined by the six general councils and the fathers. Gregory, in return, congratulated the emperor, in warm expressions of respect and loyalty, upon his accession, and assured him, that he would not only receive him for his sovereign, but would use his influence to preserve peace and amity between him and all the Christian princes of the West. In 721, Gregory held a council at Rome, in which several important canons were enacted on the subject of unlawful marriages and other points relating to ecclesiastical discipline. While this council was sitting, Winifrid, afterwards archbishop of Mentz, and known by the name of Boniface, arrived on a pilgrimage at Rome, where he was received with extraordinary marks of respect. A few years after this, Ina, king of the West Saxons, arrived at Rome, on a pilgrimage to the tomb of the Apostles, having resolved to renounce the world, and embrace the monastic life. During his stay in the city, he built a college for the education of youth, and the reception of such of his subjects as should undertake pilgrimages; for the support of which he imposed a tax on every house or family, known by the name of Rome-foot or Peter-pence. This tax, which, about the middle of the ninth century, was laid on the whole kingdom of England, was originally destined solely to the charitable uses above-mentioned, but it was afterwards converted, by the popes, to their own use, and levied under the denomination of a tribute to St. Peter, till Henry delivered the country of the burden. About the year 726, Leo, determined to restore the Christian worship to its primitive state, forbade all kinds of image-worship, and caused the edict to be promulgated through the empire. He gave notice of the same to the pope, requesting his assistance in carrying the resolution into effect, but Gregory made no scruple of avowing his decided opposition to the measure, and threatened the emperor with the indignation of St. Peter, should he persist in his projected reform. The emperor was not to be intimidated: he published his edict in Italy, but the populace was seriously against the innovation, and insurrections were immediately excited, which the soldiery could not suppress without much mischief and bloodshed. Luitrand, king of the Lombards, joined the popular cry, and taking advantage of the disturbances, made a rapid progress in Italy. Every where he declared his readiness to protect image-worship, and every where he was received by the people as one sent from heaven to defend the Catholic faith. These events went beyond the wishes of the pope, he was filled with the utmost consternation, well knowing that if the Lombards were suffered

to make head in the Italian territories, he should feel the weight of their yoke. He applied for assistance to Ursus, the doge of Venice, which was readily granted, and which was effectual in securing the emperor's dominions from the power of the Lombards. Gregory pursued his design, and urged Leo, by all the eloquence in his power, to abandon his plan with regard to image worship; but the determination of the emperor was unalterable, and he took measures to get possession of the person of Gregory, to prevent him from fomenting divisions, and even rebellion among the people. Gregory obtained timely notice of his intention, and frustrated the design: he immediately thundered out a sentence of excommunication against the emperor's exarch, for endeavouring to obey his master; and the people instantly took up arms, overpowered the garrison, pulled down the statues of the emperor, broke them in pieces, and openly declared that they renounced their allegiance to him as sovereign: not satisfied with this, they some time afterwards murdered all those who were adherents to the emperor's cause, and among others the exarch himself. Notwithstanding this opposition, the emperor in 730 held a council of the senate, the great officers of the state, and the bishops who were at Constantinople, in which it was determined, that as it was found by experience that images could not be suffered to remain in churches, and idolatry prevented, they should all be pulled down and destroyed. This being effected, he made a new effort with regard to the churches in the West: he again solicited the pope, but Gregory's answer breathed a determined spirit of hostility, and was written in a style of arrogance and abuse which was unexampled. He went still farther, he assembled a council at Rome, consisting of all the neighbouring bishops, which issued a decree, not only declarative of the lawfulness of worshipping images, but commanding them to be worshipped, and condemning, as heretics, all who did not worship them, or who should presume to teach that they were not to be worshipped. The emperor, indignant at this assumption of power, seized on the rich patrimonies of the Roman church in Sicily and Calabria, tore from the Roman see the provinces of East Illyrium, and subjected the whole to the patriarch of Constantinople. By this conduct he inflicted the most severe wound in the heart of the pope, but before he had time to ripen any schemes of revenge, he died in 731, after he had sat in the papal chair near seventeen years. From the details of his actions already given, it appears that Gregory had a zeal for exalting the power and dignity of his see; he was besides arrogant and superstitious. As an author there are fifteen of his "Letters," and a "Memoir," transmitted to his legates in Bavaria, containing instructions for their guidance in managing the ecclesiastical affairs of that country. These are inserted in the sixth volume of the "Collectio Conciliorum:" he was author also of a liturgy, which was printed, with a Greek version, at Paris in 1595. Moreri.

GREGORY III, pope, was a Syrian by birth, became a presbyter of the Roman church, and was much celebrated for his learning and talents as an eloquent and impressive preacher. Upon the death of Gregory II. he was unanimously chosen his successor by the Roman people and clergy. He seemed determined to follow the steps of his predecessor, and declared himself a determined supporter of the worship of images, and he had no sooner taken possession of his see, than he wrote a letter to the emperor Leo and his son Constantine, whom he had taken as a partner in the empire, exhorting them to renounce their error, and to return, like dutiful children, into the bosom of the church. This letter he sent by Gregory, a presbyter of the Roman church, on whose zeal and firmness he thought he could depend, but

## G R E G O R Y.

when the presbyter arrived, he understood that the emperors not only maintained their ground, but were determined to extirpate image worship, and those who presumed to justify it: he therefore thought it most prudent to return to Rome without acquainting them with the object of his mission. On his arrival, the pope was so exasperated at the pusillanimity which he had shewn, that he called a council to determine upon some exemplary punishment, but, upon his promise of going back and executing his mission, he was pardoned. He immediately set out, but as soon as he had landed in Sicily, in his way to the imperial court, he was arrested, his letter taken from him, and he himself sent into exile. In the year 732, Gregory held a council at Rome to revenge himself upon the emperor for sending his legate into banishment, and he procured a decree to be passed, establishing the worship of images, and denounced excommunication against all who should presume to pull down, destroy, profane, or blaspheme them: he even expended immense sums on the purchase of pictures and statues with which he filled the churches at Rome, and encouraged the people in the daily worship of them: he likewise caused relics to be brought from all parts to Rome, where he erected a magnificent building for their reception and worship, appointing them an appropriate service, and monks to perform it. He made another unsuccessful effort towards the conversion of the emperor, who, weary of his applications, prepared to reduce the pontiff, and the Romans who supported him, to obedience by force. Upon this event, the people of Rome, at the instigation of the pope, withdrew from all subjection to the emperor, and formed themselves into a kind of republic, in which they were governed by magistrates appointed by their own authority, under the pope, not as prince, but only as their head. After this they were involved in hostilities with Luitrand, king of the Lombards, who ravaged their whole country, and even laid siege to the city. In this extremity, Gregory applied for assistance to Charles Martel, who refused to interfere till proposals were made that the pope and Roman people should solemnly renounce their allegiance to the emperor, as an avowed heretic, and persecutor of the church, and that they should acknowledge Charles for their protector, and confer on him the consular dignity; and, on the other hand, Charles was to engage to protect and defend the pope, the Roman church, and the people of Rome, against the Lombards, and likewise against the emperor, should they either be attacked or molested. To these terms Charles readily acceded, and as soon as Luitrand heard of the treaty he abandoned the siege of Rome, and retired to his own dominions. Gregory did not live long to enjoy the fruits of this policy, which contributed materially to the separation of the Italian provinces from the Grecian empire. He died in 741, after a pontificate of between ten and eleven years. The only literary remains of this pope are "Seven Letters," which are to be found in the fourth vol. of the "Collect. Concil." Moreri.

GREGORY IV., pope, a native of Rome, succeeded to the high office on the death of Valentine, in the year 827. He is commended for his extraordinary piety, of which some of the strongest testimonies are repairing and adorning churches and monasteries, and instituting the festival of "All Souls" day. When the quarrel took place between the emperor Lewis le Debonnaire, and his sons, Lotharius persuaded the pope to accompany him into France, to mediate a reconciliation between him and his father. When the pope had served this purpose, he was permitted to return to Rome, where the best action performed by him that we read of, was his rebuilding and fortifying the city of Oria, as a protection against the descents of the Saracens. This

pope died in 844, having presided over the Roman church about 16 years. Three of his "Letters" are extant in the seventh vol. of the Collect. Concil. Moreri.

GREGORY V. pope, whose original name was Bruno, was a German by birth, and a relation of the emperor Otho. He was chosen bishop of Rome when he was but twenty-four years of age; at his ordination he assumed the name of Gregory, and in a very short time after he solemnly crowned Otho emperor, who had before been only styled king. He held a council in the first year of his pontificate, at which the emperor was present, and, it has been said, the German electoral college was instituted, but it is more probable, from the evidence of history, that the origin of this college is to be referred to a later date. Upon the breaking up of the council, he returned to Germany, having first made the Romans swear allegiance to him, and obedience to the pope, but scarcely had the Germans repaid the Alys, when Crescentius, a man of considerable wealth and power, persuaded them to revolt, renounce their allegiance to the emperor, and choose himself for their head. These events obliged Gregory to fly from Rome, on which occasion Crescentius declared the see vacant, and caused a person named Philagathus to be raised to it, who took the name of John XVII. Gregory excommunicated the usurper, and also his patron, a sentence which was confirmed by all the bishops of Italy, France, and Germany. Soon after this Otho, urged by the intreaties of Gregory, returned to Italy, with a large army, and advanced with the pope towards Rome. At their approach, the anti-pope John took to flight, but, falling into the hands of some of the pope's friends, was deprived of his sight, and otherwise cruelly mutilated. Crescentius was also taken, and, with his accomplices, ignominiously executed. Gregory was now restored to his see, and one of his first acts was to convene a council to meet at Rome, in which the marriage of Robert, king of France, with Bertha, widow of Odo, count of Champagne, was declared incestuous and null. He died in the beginning of 999, having left behind him many honourable testimonies of the vigilance and fidelity which he had exhibited in his office. His reign was very short; there are four of his "Letters" extant, in the 9th vol. of the Collect. Concil. A fifth, concerning the privileges of the abbots of Mont. Major, may be found in the 4th vol. of "Baluze's Miscellanea." Moreri.

GREGORY VI. pope, whose original name was John Gratian, was descended from one of the most opulent families of Rome, and elected pope in 1044, as successor to Benedict. Upon his accession, there were no fewer than three persons who were pretenders to the honour of being successors of St. Peter. In this state, Henry III. king of Germany, resolved to go to Italy himself, and to put an end to the dispute into the conduct of the pope, and the state of the church. He assembled a council at Sutri, in 1047, and sent an invitation to Gregory to preside at this council; with which he readily complied, flattering himself that the king would acknowledge him for lawful pope. But when he made his appearance there, a charge was preferred against him of having purchased the pontifical dignity with a sum of money. He confessed himself guilty of the charge, and, quitting his chair, divested himself of his pontifical ornaments before the council, and, begging forgiveness, renounced all claim to the throne of St. Peter. After this abdication, Henry carried him prisoner into Germany, where he ended his days. During the short time that he was at the head of the church, he performed some very beneficial acts. Finding the lands and roads infested by robbers, and other disorders prevailing

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vailing in the government, Gregory acted with such vigour, that a powerful party was raised up against him by those who had been accustomed to live by plunder. Moreri.

Gregory VII pope, who, by his talents, raised the Roman see to the highest pitch of power, is said to have been the son of a carpenter, and to have been born at the small town of Soana, in Tuscany. His original name was Hildebrand, by which he is frequently known in history. He was educated at Rome, where he was highly esteemed by Benedict IX. and Gregory VI., on the latter of whom he attended, when he was sent prisoner to Germany. Upon the death of Gregory, Hildebrand embraced the monastic life in the monastery of Cluny, where he was raised to the post of prior. By Leo IX. he was created sub-deacon, and by Nicholas II., archdeacon of the Roman church; by these pontiffs, and by some others, he was successfully employed in several negotiations. Under the pontificate of Alexander II. he was made chancellor of the holy see, and had the absolute administration of all affairs, both ecclesiastical and civil, as well as the entire disposal of the revenues of the church of Rome. Upon the death of pope Alexander, Hildebrand appointed a fast to be kept, and prayers to be offered up for three days together, before they should proceed to the election of a new pope. While they were performing the obsequies of Alexander in the Lateran church, on the day after his death, the assembled people tumultuously cried out with one voice, "Hildebrand is pope, St. Peter has chosen him:" upon which he was immediately laid hold of and placed by force upon the pontifical throne. This election was confirmed on the same day by the whole body of the clergy and people. His next object was to obtain the confirmation of the king of Germany, which was a matter of no great difficulty, and immediately he took the name of Gregory, out of respect to his friend, Gregory VI. He was the last pope, the decree of whose election was transmitted to the emperor, or king, before his consecration, or who was consecrated in the presence of the imperial envoy. Gregory began his reign by engaging in the most bold and daring schemes for extending the jurisdiction of the Roman see, and enriching the patrimony of St. Peter. He conceived the design, not only of emancipating the church from all subjection to princes, but of subjecting all princes to the church, and the whole church to his see: of constituting himself supreme judge and determiner of all affairs, both ecclesiastical and civil; the disposer not only of bishoprics and archbishoprics, and other ecclesiastical benefices, but of kingdoms and states, and the revenues of individuals; and, in fact, sole and despotic monarch of the earth in temporals as well as spirituals. Gregory was soon embroiled in a dispute with Henry IV., and he omitted no measures which he thought likely to strengthen his party, and, aided as he was by the superstition of the times, as well as by the resentment of several princes, whom Henry had disoblged, or who wished to shake off his authority, he soon created a formidable body of confederates in his support. This confederacy encouraged the pope to think of raising some other person to the throne instead of Henry, and, without hesitation, he wrote a letter to the princes, bishops, and people of Germany, empowering them to chuse another king, if Henry did not, by a sincere repentance, render himself worthy of being replaced on the throne, which he had forfeited by his disobedience to the apostolic see. Upon the receipt of this letter, the confederate princes and bishops held a diet at Tribur, near Mentz, and they declared the king suspended from his royal dignity, and added, that if he did not obtain absolution before the anniversary of his excommunication, he should be excluded for ever from the

throne. Henry submitted to the degradation of preparing to throw himself at the feet of the pontiff, to solicit absolution. He set out for Italy with his wife and infant son, and, after sustaining uncommon hardships in the passage of the Alps, amidst the rigours of an extremely severe winter, he arrived in that country. He was there speedily attended by the counts and bishops of Lombardy, who encouraged him to revenge the treatment which he had received from the pope, and offered to assist him with men and money. Gregory had, in the mean time, proceeded as far as Lombardy accompanied by the countess Mathilda, whose close intimacy with Gregory afforded too much reason for propagating many scandalous reports. Upon hearing of the king's arrival, and of the reception he had met with from his Italian subjects, the pope retired to the strong hold of Canosa, in the diocese of Reggio. While remaining in this fortress, many German bishops, and others who had been excommunicated for taking part with the king, repaired to him barefooted, clothed in hair cloth, to pray for absolution and forgiveness, which they did not obtain without submitting to severe penance and mortification. The pontiff enjoyed the malignant pleasure of seeing the king added to the number of his humiliated suppliants. It was some time before the pontiff would admit the monarch into his presence, and when the order was issued for the purpose, it was on the condition that he should enter at the outer gate of the fortress without attendants; and at the next gate he was required to divest himself of the ensigns of royalty, and put on a coarse woollen tunic, in which dress, and barefooted, he was suffered to stand for three whole days at the third gate, exposed to the severity of the weather, fasting and imploring the mercy of God and the pope. At length the persons of distinction who were with Gregory, affected at the sufferings of the king, began to complain of the severity of his holiness, which they said was more becoming a tyrant than an apostolical father or judge. These reports were carried to the pope, who on the fourth day admitted the king, and after much difficulty granted him absolution. When the Lombard lords heard of the treatment which the king had met with, and his opprobrious convention, they were highly incensed not only against the pope, but against Henry, whom they accused of cowardice and treachery, in submitting to beg absolution of a man whom they were determined no longer to acknowledge as their spiritual head. They seemed, at first, determined to depose him, and place his infant son on the throne in his stead, but to appease their resentment he broke the convention with the pope, resumed his title and other marks of royalty which he had laid down, and putting himself at the head of his forces, he prepared to check the pope's immoderate ambition. After various successes, in which the contending armies were alternately victorious, Henry summoned a council of German bishops to meet at Mentz, who adjourned their sessions to Brixen, where they were joined by many of the Italian bishops and German and Italian princes. In this council, Gregory was accused of oversetting the hierarchy, and making himself sole monarch of the church; encouraging sedition and rebellion; persecuting, excommunicating, and deposing a peaceable king, and placing a rebel on the throne. For these crimes they resolved that he should be deposed, and another chosen in his room. Notwithstanding these measures, Gregory was able to recover himself, but he was again embroiled in new difficulties, and the Romans became so incensed against the pope whom they considered as the author of the many calamities which they had endured, that apprehensions were entertained of his safety at Rome, and he thought proper to place himself under the protection



protection of duke Robert at Salerno. In that place he died in 1085, having held the see of Rome little more than 12 years, and leaving Europe involved in complicated calamities to which his ambition gave rise. "He was," as Mosheim has well described him, "a man of uncommon genius, whose ambition, in forming the most arduous projects, was equalled by his dexterity in bringing them into execution; sagacious, crafty, and intrepid, nothing could escape his penetration, defeat his stratagems, or daunt his courage; haughty and arrogant beyond all measure, obdurate, impetuous, and intractable, he looked up to the summit of universal empire with a wishful eye, and laboured up the steep ascent with uninterrupted ardour and invincible perseverance, void of all principle, and destitute of every pious and virtuous feeling, he suffered little restraint in his audacious pursuits from the dictates of religion, or the remonstrances of conscience." He was the first pope who claimed the power of deposing princes and absolving subjects from their oaths of allegiance. He also laid claim to most of the kingdoms and states of Europe, and by the boldness of his pretensions, and his menaces of exercising the ecclesiastical authority, terrified many of their sovereigns and rulers into acknowledgments of their being feudatories and vassals of the apostolic see. Three hundred and fifty-nine letters of this pope have reached our time, which are divided into nine books, and are inserted in the 10th volume of the Collect. Council. He is generally supposed to have been the author of "A Commentary upon the seven penitential Psalms," which some writers have improperly ascribed to Gregory I.; and of a "Commentary upon the Gospel of St. Matthew," which is said to be preserved in MS. in the library at Lambeth. Bower. Moreri. Mosheim.

GREGORY VIII. pope, originally known by the name of Albert de Mora, was a native of Benevento, and created cardinal by pope Adrian IV. in the year 1135. He was employed in very important missions, viz. as legate to Spain, and in the year 1172 into Normandy, where he absolved Henry II. king of England, from the censures which he had incurred by being supposed in some degree accessory to the death of Thomas a Becket, but not before that monarch had submitted to a disgraceful penance. Upon the death of Urban III. in the year 1187, cardinal Albert was unanimously chosen his successor, when he took the name of Gregory VIII. A short time before his election, intelligence had arrived at Rome of the advantages gained by Saladin over the Christians in the East, and his capture of the city of Jerusalem. Gregory, as soon as he was consecrated, wrote a letter addressed to the Christians in the West, exhorting them to contribute all in their power to the relief of their distressed brethren, and for the recovery of the holy city. He enjoined a five years' fast, to appease the anger of heaven, by abstaining from meat on Wednesdays and Saturdays as well as Fridays throughout the year. The labours of this pontiff were of very short duration. He died within two months of his elevation. He has been applauded for his learning, eloquence, humane disposition, and exemplary manners. There are three of his letters extant in the tenth vol. of the Collect. Council. Moreri. Bower.

GREGORY IX. pope, whose former name was Ugolin, was created cardinal bishop of Ostia, by pope Innocent III., and was afterwards employed on different legations to Germany and elsewhere, chiefly to preach up the necessity of engaging in the crusades. He was elected pope upon the death of Honorius III. in the year 1227, when he took the name of Gregory IX. Immediately after his consecration he commanded the western bishops to exert their authority, and oblige such persons as had taken the cross, to set out

without delay for the Holy Land. He wrote also to the emperor Frederic II. exhorting him to fulfil the solemn promises which he had made to embark a sufficient army for the relief of the Christians in the East, adding the severest menaces if he should decline the undertaking, declaring that he would exert the power which heaven had put into his hands, and proceed against him as guilty of a breach of his vows. Frederic was obedient to the order, but having embarked with a large army, he returned in three days, alleging that the ill state of his health rendered him incapable of so great an exertion. His excuses were not deemed valid, the pope would hear of no apologies, and passed on him sentence of excommunication, till at length the emperor embarked for Palestine, but not having sued for absolution before his departure, he was still the object of Gregory's resentment, who took every method to render his expedition fruitless, and to excite civil wars in his Italian dominions. Even after the emperor had, by treaty, secured possession of the city and kingdom of Jerusalem, and was preparing for his coronation there, by the patriarch he found that the prelate had been terrified by the papal emissaries from taking a part in the ceremony, and had also laid the city, and the church of the sepulchre, under an interdict, that no divine service might be performed in them during Frederic's stay. The German bishops, likewise, who attended the emperor, partook so much of the patriarch's alarms, that they refused to perform any religious function, or even to be present at the coronation; so that Frederic was under the necessity of taking the crown from the altar, and placing it upon his head with his own hands. On the emperor's return in 1229, Gregory excommunicated him again; and new causes of complaint were continually occurring between Frederic and the pope, the former being desirous of acting for himself, and the latter being fully bent upon reducing him to the most abject slavery. In the year 1241, Gregory called a general council to meet at Rome, and had sent legates with letters to all the Christian princes, entreating them to oblige the prelates in their respective kingdoms to repair to it. At first Frederic consented to the holding of the council, and promised not to molest the bishops who should attend it. But afterwards, finding that the pope was resolutely bent on his ruin, and that he intended to make use of the proposed council for this purpose, and even to arm the whole Christian world against him, he revoked his promises, and published a manifesto, which was sent through the whole of Europe, declaratory of his determined opposition to the pope's project. Nevertheless, great numbers of the bishops did assemble at Genoa, in their road to Rome, who, with two cardinals and all their treasure, fell into the emperor's hands, and the holy men were sent prisoners to Naples. This disappointment, together with the approach of the emperor, and his victorious army, gave such a shock to the pope, that he was seized with an illness which put an end to his life in a few days. He had been at the head of the church nearly fifteen years, which were distinguished by the calamities in which Italy was involved, chiefly owing to his immoderate ambition, injustice, arrogance, and obstinacy. Many of his letters are to be found in the eleventh vol. of the Collect. Council; there are also extant some fragments of his "Decretal Letters." Moreri. Bower.

GREGORY X. pope, whose original name was Theobald, was first a canon in the church of Lyons; then archdeacon of Leige, and, taking the cross, he accompanied Edward prince of Wales in his expedition into Syria. After the death of Clement IV. in 1278, the Roman see was vacant for nearly three years, owing to the intrigues of the cardinals, assembled at Verbo, who all aspired to the dignity

themselves, and opposed the election of any other. At length the magistrates, tired out with the delay, ordered them to be closely confined in the bishop's palace, where they were subjected to many inconveniences, and they began daily to lessen their allowance of provisions. At length they chose Theobald, who was at that time with the crusaders in the East. Friars were dispatched to announce to him the important news; they found him at Ptolemais, now called Acre, waiting for a favourable opportunity of passing to Jerusalem, but upon receiving the decree of his election, he resolved to embark for Italy. Before his departure he preached a sermon to the Christians at Ptolemais from these words, "If I forget thee, O Jerusalem, let my right hand forget her cunning, &c." And in his sermon he gave them very solemn assurances that he would render them every assistance in his power. He never forgot his promises, but both before and after his consecration, the success of the crusades was an object the nearest his heart. With this view he signified his intention of convening a general council at Lyons in 1274, and invited Michael Palæologus to meet it, in order to complete a work so necessary for the harmony and security of Christendom. In 1273, while Gregory (a name which he assumed at his consecration) was at Orvieto, Edward, who was now king of England, arrived at the city on his return from the Holy Land, and was received by the pope with every mark of esteem and affection. On the king's complaining of the cruel murder of his cousin Henry, son of the duke of Cornwall by Guido, the pope instantly summoned Guido to appear before him within a limited time. Upon his paying no regard to this summons, he was not only excommunicated, but declared infamous, with all his descendants to the fourth generation, and all were anathematized, as equally guilty, who should receive, favour, or admit him into their houses. Finding himself driven from society like a wild beast, he embraced the opportunity of the pope's travelling from Orvieto to Florence, unexpectedly to make his appearance before him, stripped of his garments to his shirt, with a rope about his neck, begging for mercy, and submitting entirely to the clemency of his holiness. Gregory gave him his life, but delivered him up to the king of Sicily to be kept in close confinement till his death. Omitting the mere political events, which happened during the pontificate, we observe that in 1274 the general council which Gregory had summoned met at Lyons, and was by far the most numerous of any that had ever been held. The principal points which occupied its attention, were the procuring relief for the Christians in the East, the union of the Greek and Latin churches, and the restoration of ecclesiastical discipline. The first object, Gregory persuaded the dignified council to devote a tenth of their income for the space of six years. While the council was deliberating, Gregory deposed the bishop of Liège, on account of his irregularities and profligacy. This council introduced the famous constitution which provides that the cardinals shall be shut up in the curia during the vacancy of the pontificate. Gregory died soon after the termination of the council, having held the Roman see four years and four months. Several of his "Letters" are extant in the eleventh volume of the "Collection." He is mentioned by historians on account of his extraordinary sanctity, and there seems sufficient reason to believe that he was influenced by a milder spirit than many of his predecessors. In none of them, however, is it possible to observe any conduct at all corresponding to the benevolent spirit of Christianity: in none of them do we behold any attempt, however distant, to imitate the example of Christ, whose disciples, in a superior degree, they professed themselves. Moreri. Bower.

GREGORY XI. pope, son of the count de Beaufort, and nephew of pope Clement VI. was created cardinal before he had completed his seventeenth year, and even then had accumulated upon him a number of rich benefices for the support of his new dignity. He was honoured also with other high offices in the church, while he was thus young. At this time he could have made no great progress in literary acquirements, but it is much to his credit that he afterwards applied himself so closely to study, under the instructions of the learned Baldi and other eminent tutors, as to become one of the ablest civilians, canonists, and divines of his time. Upon the death of pope Urban V. he was chosen his successor, and was consecrated at Avignon, which was then the seat of the papal residence, in the beginning of the year 1371, when he was about forty years old. Almost as soon as he was consecrated, he sent legates to mediate a peace between the kings of France and England, and wrote to those princes, pathetically exhorting them to spare the blood of their subjects, and to compose their differences in a Christian and amicable manner: but unfortunately without success. In the same year he created twelve cardinals at once, and upon the cession of Sicily to Frederic of Arragon, Gregory erected that island into a kingdom, on condition that the kings should do him and his successors homage. In 1374, the Florentines, having entered into an alliance with the Visconti of Milan, invaded the territories of the church, making themselves masters of several cities, and encouraging the people to throw off the papal yoke, and resume their liberty. Gregory's remonstrances on this occasion being fruitless, he issued out a bull of excommunication against the Florentines, which prohibited all people and nations from any communication or commerce with them; declared their estates forfeited, and the lawful property of those who should seize them. To his bull Gregory added other and still more forcible arguments to convince the Florentines of their error. He raised an army of ten thousand men which he sent under the command of the cardinal of the twelve apostles; and which was successful in stopping the ravages of the enemy. The Florentines, whose existence almost depended on their commerce, finding their traffic entirely stopped by the pope's bull, thought it prudent to make an attempt at reconciliation with the apostolic see, but the terms to effect this could not be agreed on by both sides, and hostilities were carried on with ardour, and chiefly in favour of the invaders. Gregory had hitherto resided at Avignon, though he had frequently been invited to Rome. In 1377, he arrived in that city, where he was received with great marks of joy by persons of all ranks, but the magistrates, though anxious for his presence among them, refused to give up any part of their power. Gregory having no means of establishing his authority, thought it prudent, and becoming his dignity, to withdraw to Anagni; but before he left Rome, he wrote several letters to England, against Wickliff and his doctrines, commanding the imprisonment of that worthy reformer and the suppression of his opinions. Wickliff, however, was so much respected and beloved by the English nobility, and people at large, that the bishops, to whom the pope's letters were addressed, did not dare to attempt his arrest. Towards the close of the year, Gregory, having come to some terms with the citizens of Rome, returned to that city, where he continued to receive many mortifications, which led him to the resolution of removing the papal seat to Avignon. But before he could execute his resolution he was taken off by death in 1378, after a pontificate of little more than seven years. He left behind him many letters, of which the greater part have been published by Waddingus. He is praised by his biographers

Biographers for piety, benevolence, and humanity: he was a patron of men of letters, and was himself respectable for learning, particularly in civil and canon law. He was apt to be partial to his own relations, and paid more regard to their recommendation in the disposal of preferments than to the merit of the persons whom they recommended. Bower. Moreri.

GREGORY XII. pope, whose original name was Angelo Corario, was a native of Venice, and was preferred to the bishopric of that city by pope Urban VI. By Boniface IV. he was made titular patriarch of Constantinople, and by Innocent VII. he was raised to the dignity of Cardinal in 1405. He was now eighty years of age, and upon the death of Innocent in the following year, Angelo Corario was raised to the chair of St. Peter, and at his consecration took the name of Gregory XII. Peter de Luna was a rival candidate for the supreme honour, and assumed the name of Benedict XIII. Upon the consecration of Gregory he wrote to Benedict, and the rival competitors agreed to hold a congress at Savona in the year 1407, accompanied by their respective cardinals, with a view of restoring order in the church. It is probable that neither of them was desirous of this interview, but that both were secretly determined to use every means in their power to retain their dignities. Gregory refused to repair to the congress, though the meeting had been proposed for himself, which gave his enemies great advantage over him; his cardinals, disgusted at his conduct, deserted him, and withdrew to Pisa, where they published a manifesto in justification of their procedure, and an appeal to a general council, of which they sent copies to all Christian princes and states. A council was held at Pisa in March 1409, which was attended by a numerous body of ecclesiastics, and ambassadors from the kings of France, England, Sicily, &c. and after fifteen sessions it passed sentence of deposition against Benedict and Gregory, who were declared guilty of heresy, perjury, and contumacy, and unworthy of the smallest tokens of honour or respect, and cut off from the communion of the church. Alexander V. was elected in their stead. Gregory, after some fruitless resistance, formally sent in his resignation to the council of Constance, laying aside all marks of the pontifical dignity. The council were so well pleased with his submission that they decreed he should retain the dignity of cardinal so long as he lived; and that he should have the precedence among the cardinals, and the title of perpetual legate of the marche of Ancona. He died at Recanati in 1417, when he was ninety-two years of age. Some of his letters are extant in the eleventh and twelfth volumes of the "Collect. Concil." He never was a man of shining parts; but at the time of his advancement to the head of the church, he was highly esteemed on account of his probity, but before his death he had so completely lost his character, that no credit whatever was paid to his declarations, though made in the most solemn manner. Bower. Moreri.

GREGORY XIII. pope, was born of a very respectable family at Bologna, in the year 1502. He was brought up to the study of the civil and canon law, made uncommon proficiency in the pursuit, and taught the science in his native city with uncommon reputation for more than eight years. When he was about twenty-eight years of age, he took his degree of doctor, and was afterwards appointed judge of the court of commerce at Bologna, erected for the trial of mercantile causes. He removed to Rome, was employed in some important missions, admitted into the church, obtained considerable preferment, and on the death of Pius V. in 1572, he was unanimously elected his successor, and at his consecration he took the name of Gregory XIII.

The most important event in the pontificate of Gregory, was the reformation of the calendar, according to a method suggested by Lewis Lilio, a Calabrian astronomer, which after his death was presented to the pope by his brother. This method, which is fully explained under the word CALENDAR, and referred to in divers other articles in our work, was immediately adopted in all Catholic countries, but was rejected by the Protestants, and by the Greeks, who chose rather to remain in error, than be indebted to the pope for the knowledge of the truth. In 1584, Gregory incurred the suspicion of having encouraged the assassination of Elizabeth queen of England, by Parr, an English Catholic, who was detected in a conspiracy against the queen's life. There was, however, no direct proof of Gregory being at all privy to the scheme. This pope contributed greatly to correct and amend Gratian's decretals, which he enriched with learned notes. A short time before his death, he received ambassadors from the islands of Japan, where the labours of Xavier and other Jesuits were said to have been crowned with abundant success. The ambassadors had a most flattering reception given them, and great rejoicings were ordered to be made in the city, on account of the prospect which their appointment seemed to open, of triumphs to the Catholic faith in a rich and populous empire. In the midst of these rejoicings Gregory was seized with a quinsey, which carried him off in the 84th year of his age, and the 14th of his pontificate. Several of his "Letters," "Harangues," &c. are said to be in existence, and preserved in the cabinets of the curious. He was much beloved by the Romans on account of the mildness of his government, which, by degenerating into weakness, gave occasion to numerous irregularities, and an almost general corruption of manners in the ecclesiastical state. He was a zealous friend to the Jesuits, to whom he granted many privileges, and built for their use, and richly endowed, the Roman college, and nearly thirty other seminaries in different parts of the world. Moreri. Bower. Univer. Hist.

GREGORY XIV. pope, son of a senator, who, after the death of his wife, embraced the ecclesiastical life, was made bishop of Cremona, and appointed cardinal with the same title. Upon the death of Urban VII. in 1590, the conclave was divided by the pretensions of 16 candidates for the papal chair, who were all rejected, and Nicholas Sfondrati, the subject of this article, was elected and acknowledged pope, and upon his consecration took the name of Gregory XIV. He performed many humane acts as soon as he was settled in his see, and then endeavoured to signalize himself as the zealous defender of the Catholic faith. Among other public measures, he sent bulls into France, in which he declared Henry IV. excommunicated, and threatened the nobles with ecclesiastical censures if they did not desert his cause. In France these bulls were treated with the contempt which they merited: they were besides declared scandalous and seditious, and ordered to be burnt by the common hangman. The pope would probably have taken measures to avenge the insult thrown upon his decrees, but he died of the stone in the year 1592, when only in his fifty-seventh year, and in the seventh of his pontificate. As a man, he is said to have lived a devout and abstemious life, and to have practised austerities which would rather have suited a cloister than the seat of sovereign power. He created one of his nephews cardinals, and raised six other persons to the same dignity; and he also granted the dukedom of Ferrara to duke Alphonso, who, as he had no son, endeavoured to settle the dignity on some of his relations. Bower. Moreri.

## GREGORY.

GREGORY XV., pope, descended from a noble family at Bologna, and named before his election, Alexander Ludovisi, was born in the year 1554. He was educated among the Jesuits at Rome, and then returned to Bologna, where he studied the civil law, and took his degree of doctor in that faculty. Having attained this literary honour, he went back to Rome, where he acquired the friendship of three popes, viz. Gregory XIV., Clement VIII., and Paul V., of whom the last appointed him archbishop of Bologna, and sent him out as nuncio to adjust some differences which had taken place between the Spaniards and the duke of Savoy. For his able conduct in this difficult business he was promoted to the rank of cardinal. On his return he resided on his diocese till the death of his patron Paul, in 1621, when he went into conclave with the other cardinals, and was almost unanimously chosen pope, and assumed the name of Gregory XV. Where his own particular sentiments were not immediately concerned, he was a man of mild manners and very humane disposition, but the whole of his papacy was marked with a violent excess of zeal and bigotry against the Protestants. As the Hugonots of France had, by the violation of the edict of Nantz, been driven to take up arms in their own defence, he wrote to Lewis XIII., exhorting him, by every argument in his power, to destroy or extirpate them; and to prove the extent of his zeal, he accompanied the letter with a bull, intended to animate the Papists in their sanguinary and savage undertaking. He next published a bull, prescribing a new form in the election of a pope, by which the cardinals were allowed to give their suffrages secretly, by way of scrutiny, by which he intended to prevent the chiefs of parties from having so great an influence in future elections. As a politician, he supported, to the utmost of his power, the emperor Ferdinand II. and Maximilian, duke of Bavaria, against the elector palatine of the Rhine, son-in-law of James I. of Great-Britain: by his aid they were enabled to conquer the palatinate, an event that gratified him as well by the injury which it did to the interests of the reformed religion in Germany, as by the share which it gave him in the spoil of the valuable library of Heidelberg, a part of which was transferred to the Vatican. He also attempted the destruction of Calvinism, by endeavouring to persuade Lewis XIII. to allow the duke of Savoy to seize upon Geneva, the nursery of that system; but in this object he was disappointed. He was likewise unsuccessful in an attempt which he made to reinstate the Jesuits at Venice, from whence they had been banished during the pontificate of Paul V. In 1622 the Turks invaded Poland with a formidable army; to resist their power, Gregory sent immense supplies of money to Sigismund, by which he was enabled to withstand the barbarian power, and finally to gain a signal victory over them. About the same time the pope instituted the famous college, "De propaganda fide," and endowed it with ample revenues for the maintenance of persons to be educated for foreign missions. Gregory endeavoured to turn to his own purpose the intended marriage between the prince of Wales, son of James I. and the infanta of Spain: he refused to grant a dispensation for the marriage, but upon very severe conditions, to all which James seemed willing to submit, when the affair was suddenly suspended by the pope's death, which happened in 1623, after he had filled the papal see about two years and a half. He was the author of some literary productions, which have been lost, likewise of "Epistola ad Regem Persarum Schah Abbas, cum notis Hegalfoni;" and "The Decision of the Rota." He is highly commended for his piety and great learning, particularly in canon law, and for his charity to the sick and poor. He was, in a certain degree, the encour-

ager and patron of learning, and when his nephew, cardinal Ludovisi, had formed a kind of literary academy in his palace, he was frequently present at their meetings, and did all in his power to promote the extension of science and useful learning. He was a great friend to the Jesuits, and canonized their founder, Francis Xavier, and by him the see of Paris was withdrawn from subjection to that of Sens, and erected into an archbishopric. Moreri. Univer. Hist. Bower.

GREGORY of Neo-Cæsarea, surnamed *Thaumaturgus*, or Wonder-worker, from the miracles which he pretended to perform, was born at Neo-Cæsarea, in Pontus, and flourished in the third century; he is usually styled a saint, and was known, before his conversion to Christianity from Paganism, by the name of Theodorus. His father was a zealot for the principles in which he educated his son, but he caused him to be instructed in the elements of useful and ornamental learning. He provided for him the most able tutors, one of whom earnestly recommended to his pupil the study of the Roman law, as what might be highly advantageous to him in future life. With this advice he complied, and made himself master of the principles of the science. Having laid the foundation of learning at home, he set out upon his travels. In Phœnicia he endeavoured to improve his knowledge of law under the celebrated professors of that science who resided there. He had a sister married to a lawyer in high esteem with the governor of Palestine, and chosen by him to be one of his counsellors. This lady was sent for by her husband to Cæsarea, and as the officer who came to escort her brought with him a greater number of carriages than were sufficient for her and those who would attend her, Gregory was induced to make one of the party. At Berytus he attended a school of philosophy lately opened by the celebrated Origen. For five years Gregory and his brother were disciples of this great master, who instructed them in logic, physics, geometry, astronomy, and ethics. He encouraged them in reading all sorts of ancient authors, poets, and philosophers, whose tenets were not sceptical. He restrained them only from such as denied a deity, or a superintending providence. It was during their attendance upon Origen that they became enlightened and zealous Christians; he introduced them to a knowledge of the sacred scriptures, and explained to them the passages which to their minds might appear obscure and difficult. About the year 239, Gregory returned home: he took leave of Origen with great regret, but not before he had pronounced before a numerous auditory a panegyric oration in praise of his tutor, which is esteemed by Dupin one of the finest pieces of rhetoric in all antiquity, and which affords at once a proof of the writer's eminent abilities, and of Origen's excellent method of educating those who were placed under his tuition. The tutor was attached to his pupil, and after his return to Neo-Cæsarea, he wrote him a letter, intending, no doubt, that he should make what use he pleased of it, commending his excellent parts, which, he said, qualified him either to become a Roman lawyer of the first rank, or a philosopher of eminence among the Greeks, but he could rather wish that he would employ his great talents in the service of the Christian religion, which might be essentially benefited by his exertions. His celebrity led many to solicit him to open a school of philosophy in his native city, but a diffidence in himself led him rather to withdraw from public notice. He was next urged to undertake the office of Christian bishop, an application which he resisted a long time, though, at length, he was induced to accept the charge, and was ordained, according to Dr. Lardner, by Phœdinus, bishop of Amasea, about the year 245. He was recommended to give all his exertions to his native city, which was large and populous,

populous, but immersed in superstition and idolatry, and contained but very few Christians. By his great zeal, united to much prudence, he made numerous converts to Christianity, and established a church which is said to have been truly apostolic, both with respect to doctrine and discipline, and to have retained its purity, long after surrounding churches had admitted novelties and innovations which were a disgrace to their religion, and insensibly led the way to the grossest corruptions and abuses. This church went on flourishing and increasing under his care till the Decian persecution, in the year 250, when he thought it prudent to withdraw into retirement till the storm was blown over. He afterwards returned to his flock, among whom, during the remainder of his life, he discharged the duties of a faithful and vigilant pastor, and was instrumental in bringing not only the whole city, but the dependent district into the profession of Christianity. He was present at the first council at Antioch, in 264, when the case of Paul of Samosata was the subject of enquiry, and Gregory, with others, exerted themselves in preventing any harsh measures from being adopted against him. He is thought not to have long survived the meeting of this council, and to have died some time in the year 265. Upon the whole he was a great and good man, eminent for purity and simplicity of manners, zealous for the interests of the Christian faith and profession, and anxious to preserve them unadulterated with superstitious practices. The only works of his that are extant, which are unquestionably genuine, are his "Oration in Praise of Origen," and "A Paraphrase on the Book of Ecclesiastes." "A Canonical Epistle," consisting of eleven canons, is ascribed to him by some authors, but it is rejected by other very able and learned critics, and is considered to have been added by some modern Greek. His pieces have been frequently printed: they were collected into one volume at Paris, in 1626; and Gerard Vossius published an edition of them at Mentz, in 1604, in 4to. Dr. Lardner says there are two things to be lamented, 1st. That no more of this excellent man's writings have come down to us. It is plain that some of his writings are lost; for Jerom speaks of his epistles, whereas there is only one remaining. And Basil mentions an "Exposition of Faith," or a "Dialogue with a Gentile," which is not now in existence. 2dly. That we have no history of his life, written by some contemporary. It may be well supposed that this apostolical man was chiefly employed in increasing his church, or in building it up in knowledge and virtue, by oral instructions and works of goodness. His church continued steadfast in the faith after his death, and near the end of the fourth century the Neo-Cæsarians were all Christians, having been all along to that period blessed with pastors who were men of true worth. As Gregory, therefore, was an honour and ornament to the churches in his time, so his church continued to be an ornament to him. Lardner's *Credibility*, vol. iv. Moreri. Dupin.

GREGORY NAZIANZEN, was born near Nazianzum, in Cappadocia, about the year 324. His father was not brought up a Christian, but, by marriage, became a convert to the true faith. His learning, piety, and many virtues, pointed him out as a proper person for sustaining the episcopal character, and he was accordingly ordained, and appointed to the see of Nazianzum, where he officiated as pastor for the space of forty-five years. Gregory afforded early proofs of excellent natural abilities, and a serious turn of mind, and having made great proficiency at home, he was sent, for farther improvement, to different public seminaries of learning. He was first placed at Cæsarea, in Cappadocia, whence he removed to Cæsarea, in Palestine; thence

to Alexandria, and proceeded from that city to Athens, where he intended to finish his academical studies. At the last named city he became acquainted with Basil, celebrated in the church, and likewise with Julian, who was afterwards emperor. With the former he entered into the strictest habits of friendship. They lived together in the same house, united in the same studies, and embraced the same tenets in religion. Having been a considerable time at Athens, he felt a strong desire to visit his friends at home, and set out for Constantinople, on his journey homewards. At that city, he met his brother, Cæsarius, who had just arrived from Alexandria, and here he was strongly urged to settle, but by the influence of Gregory he declined all the flattering offers made him, and returned with him to Nazianzum. Gregory, on his return, was baptized, being about thirty years of age, and from this period he seems to have chiefly devoted himself to a studious and ascetic life, practising the austerities of monkery, and mixing no farther in the business of the world than was necessary for the management of his father's concerns. In the year 359, he visited Basil, in his retirement among the mountains of Pontus, and subjected himself to the same severe discipline which he professed. He had not long enjoyed the company of Basil, when he was sent for in haste to allay a ferment that had occurred in the church of Nazianzum. He succeeded in reconciling the differences that had occasioned the discontents; entered into orders; and was ordained presbyter. Julian, the avowed and malignant enemy of the Christians, had now ascended the throne: he published a law intended to prevent the adherents to the gospel system from being instructed in the arts and sciences, hoping to render the followers of Christ barbarians; but this effort was partly defeated by the two Apollonarii; and Gregory, who wrote a number of poems in all kinds of verse, on divers serious subjects, by which the loss of the Greek and Roman classics was in some degree compensated to Christian students, on account of their excellencies and beauties as compositions. Gregory officiated for some years as assistant to his father in the pastoral office. In this situation he was instrumental in promoting the election of his friend Basil to the see of Cæsarea, in the year 370, a circumstance, though well meant by Gregory, which had nearly occasioned a rupture between the two friends; and which determined Gregory to withdraw into retirement, where he hoped he might be allowed to spend his life in study and religious contemplation; but by his father's earnest entreaties he was induced to become his coadjutor in the episcopal office at Nazianzum, on the express condition, that after his father's death he should be perfectly free from all obligation to that charge. Accordingly when this event took place, in the year 374, he quitted Nazianzum, and retired to Seleucia, where he continued for a long time in a monastery before he returned to his native country. About the year 378 Gregory, among others, was deputed, on account of his great learning, to go to Constantinople to assist in defending the Catholic cause against the Arians, who were making head against them. When he arrived at the city he found the Catholic cause reduced to the lowest ebb, so that the Catholics themselves durst scarcely venture to avow their opinions. At first he only preached in a private manner at his lodgings, but in a short time the fame of his eloquence brought multitudes to hear him, and he converted the house in which he was into a church; to this he gave the name of Anastasia, or the Resurrection, because the Catholic faith seemed to have its resurrection in this particular spot. His success excited the jealousy of the Arian party, who incited the populace to attack him and his hearers with clubs and stones, both in the streets and assem-

his church. Gregory they dragged like a malefactor before the magistrates, accusing him of being the cause of tumult and sedition, but he was acquitted of all malice, and the persecution which he experienced served only to increase the number of his followers. His great celebrity attracted disciples from distant parts, among whom was St. Jerom, who frequently boasted of having had the honour and happiness of studying under such a master. The Catholics were now sufficiently strong in number to desire the re-establishment of the episcopal office among them, and expressed their unanimoity with that Gregory would undertake it. He met with a rival in Maximus, an Egyptian Cynic philosopher, whom he had himself baptized, and admitted to the lower orders of the church. This person contrived a scheme for supplanting him in the episcopal throne by intrigue and boldness, and engaged some of the Egyptian bishops to favour his views. Gregory, on account of ill health, was obliged to quit the city for the sake of the country air, and the confederates, unwilling to lose any time, during the first night of his absence broke into his church, and placed Maximus upon the throne. The great body of the people of all classes and parties in religion were indignant at this conduct: they assembled and with the utmost fury drove the intruders out of the church, who were now obliged to consult their safety by flight. This attempt to supplant him produced much uneasiness in the breast of Gregory, and made him very desirous of retirement, and after a time he determined to resign a charge which involved him in increasing troubles. He accordingly announced his intention to his people in a farewell discourse, in the course of which he pathetically exhorted them to persevere in the orthodox faith which he had taught them, and to be mindful of the labours and sufferings which he had undergone for that cause. No sooner had he finished his exhortations, than he was surrounded by persons of all ages, sexes, and qualities, who were so earnest in their entreaties that he would remain, that, at length, he promised not to desert them till the eastern bishops, who were expected soon to assemble at Constantinople, should release him by choosing a more worthy person to occupy his place. About this period Theodosius the Great was created a partner in the imperial throne, and avowed himself the supporter of the orthodox faith: he issued an edict, commanding all his subjects to receive the Catholic doctrine of the Trinity under the heavy penalty of being treated as heretics and infamous persons. In the year 380 he came to Constantinople, where he treated Gregory with the greatest kindness and respect, and told him that God had sent him to give him possession of the church, which he was ready to deliver up into his hands as a reward of his labours. A day was appointed for his installation, but, at Gregory's request, the ceremony was deferred for the present, and soon after having obtained the emperor's consent, he abdicated his episcopal throne, and retired to his paternal estate, near Nazianzum, with the resolution of spending the remainder of his days in studious retirement, and the exercises of devotion. In 382, however, Gregory was summoned to meet the eastern bishops at Constantinople, but he refused to attend, and told the fathers very plainly that experience had taught him how little good was to be expected from any such assemblies, in which pride and ambition chiefly predominated, and which were rather calculated to widen than to conciliate differences among Christians. Upon his return to his native country he was strongly importuned to undertake the charge of the see of Nazianzum, which had continued vacant from the time of his father's death, but he could not be prevailed upon to quit his retirement, where he died in the year 389, supposed to be about the age of

sixty-five years. He was, in many respects, a great and a good man, and an ornament to the age in which he lived. His piety was ardent and sincere, though not untinged with superstition, and his morals strict and regular, but partaking too much of the severity enjoined by monastic institutions. His benevolence and charity were boundless, and they led him to devote the whole of his income to the relief of the poor and afflicted. The works of this father consist of "Sermons," "Letters," and "Poems." They were first published at Basil in 1550 in Greek; but the best edition of them was published by Morel, in two volumes folio at Paris 1609. By Dupin he is classed with the most perfect orators of Greece, yet he admits that his style had too many antitheses, similitudes, and other rhetorical embellishments, which sometimes render his oratory effeminate. Erasmus says that he was discouraged from attempting the translation of Nazianzen's works, on account of the acumen and smartness of his style, the grandeur and sublimity of the matter, and the obscure allusions which are frequently interspersed among his writings. Moreri. Dupin.

GREGORY, surnamed *Nyssen*, a saint and father of the church in the fourth century, was a younger brother of St. Basil, and born at Cappadocia about the year 332. He was originally intended for the ecclesiastical life, though for some time he practiced as a professor and pleader with great success and applause. At the persuasion of Gregory Nazianzen, he was induced to relinquish his secular pursuits, and to apply with great diligence to the study of theology, and whatever was connected with it. As soon as he had taken orders he became as eminent in the pulpit as he had formerly been at the bar. About the year 372 he was ordained bishop of Nyssa, in Cappadocia, by his brother Basil. He became distinguished for his opposition to the Arian party, and on that account was banished by the emperor Valens two years after his ordination. On the death of that emperor, he was recalled by Gratian and restored to the possession of his episcopal see. In the year 378 he was present at the synod held at Antioch, and on his return he paid a visit to Jerusalem, in the hopes of gratifying his wishes in viewing the scenes of Christ's ministry, death and resurrection, and to endeavour to allay the factions and quarrels which existed among Christians in that city. Instead, however, of finding the virtues which might have been expected from the inhabitants of the Holy Land, he found "the place to be a sink of iniquity and debauchery, the seat of envy, malice, adultery, robbery, murder, idolatry, poisoning, and bloodshed, where men assassinated each other for a trifling reward, so that in no place were murders so frequently and so easily committed." In 381 he was summoned to the council that met at Constantinople, and to him was confided the task of drawing up a creed, which was adopted, and is the same as that which has been received into the English liturgy, under the name of the *Nicene Creed*, excepting the words "and the son," in the part relating to the Holy Ghost, which were added at a later period. He was engaged in other councils, and his name appears in the lists of the prelates who were present at the synod held at Constantinople in the year 394. It is not certain how long he lived after this period. He had entered into the marriage state early in life, and continued to live with his wife after he had been advanced to the episcopal rank. His works, which consist of commentaries on different parts of the scriptures; controversial treatises; sermons and funeral orations; biographies of distinguished persons, letters, &c. are many of them more like the treatises of Plato and Aristotle, than those of other Christians. Moreri.



GREGORY, GEORGE FLORENCE, commonly known by the name of Gregory of Tours, was born about the year 544. He was educated for the ecclesiastical profession, was a proficient in the learning of the times, and acquired considerable reputation by his talents as a preacher. Being attacked by a dangerous illness, he paid a religious visit to the tomb of St. Martin at Tours, which proved the occasion of his introduction to the nobility, clergy, and other inhabitants of that city, whose good opinion he conciliated by his behaviour among them. So strong was the impression made in his favour, that on the death of Euphronius, bishop of Tours, in 573, he was unanimously elected his successor. In the year 594 he took a journey to Rome, to visit the tombs of the Apostles, and to pay his respects to pope Gregory the Great, who received him with extraordinary marks of esteem. He died soon after his return to his diocese, in 595, when he was in the fifty-second year of his age. He was author of "The History of France;" "The Lives of the Saints;" "Fragments of a Commentary on the Psalms," and other pieces. The style and language of the history are harsh and inelegant, but it supplies the historian with facts which serve to fill up the chasms in the annals of the dark ages, and which carry with them strong internal marks of authenticity. The best edition of Gregory's works is that published at Paris in 1699. Moreri. Dupin.

GREGORY of Rimini, one of the most subtle schoolmen in the 14th century, was born in the city whence he took his surname. He became a monk of the order of the Hermits of St. Augustine, and taught with great applause in the university of Paris. He was made general of his order at Montpellier in 1357, and died in the following year at Vienna. As an author, he is known by "Commentaries on the Four Books of Sentences;" "Commentaries on the Epistles of St. Paul;" and "On the Epistle of St. James;" by "A Treatise on Usury;" "Sermons," &c. Moreri. Bayle.

GREGORY ST. VINCENT, a Flemish geometrician, was born at Bruges in the year 1584. He studied mathematics under Clavius, and became a member of the society of Jesuits at Rome. He acquired a very high reputation in the sciences, was chosen to some high offices, and was selected by Philip II., king of Spain, to be mathematical tutor to his son, prince John of Austria. He died at Ghent in 1667, at the age of eighty-three. He is known as author of three learned mathematical works, of which the principal is entitled "Opus Geometricum Quadraturæ Circuli, et Sectio-nium Coni, decem Libris comprehensum," 1647, in two vols. folio. In this work he shews, that if one asymptote of an hyperbola be divided into parts, in geometrical progression, and from the points of division ordinates be drawn parallel to the other asymptote, they will divide the space between the asymptote and curve into equal portions. Moreri.

GREGORY, JOHN, a learned English divine, was born at Agmondesham, Bucks, in the year 1607. He received a good education, and was placed in the quality of servitor to Christ-church college, Oxford, in 1624, where he was under the tuition of Dr. George Morley, afterwards bishop of Winchester. In this college he took his degrees, and was appointed one of the chaplains. In the year 1634 he published a second edition in quarto, of sir Thomas Ridley's "View of the Civil and Ecclesiastical Law," with notes: by this work he acquired a high degree of reputation, on account of his deep and extensive learning, and the skill which he shewed in ancient and modern languages, Oriental as well as European. He obtained some considerable pre-

ferment in the church, particularly a prebendary in the see of Salisbury. This he did not long enjoy, owing to the civil wars, in which our author was an active partisan of the royalists. Being now much reduced in his means, he took up his abode at an obscure ale-house near Oxford, where he remained in great privacy, devoting all his time to literary pursuits. He died before he had arrived at his fortieth year: he had, however, attained to the favour and correspondence of many of the greatest men of his age. In 1646 he published "Notes and Observations on some Passages of Scripture;" which were afterwards inserted in the "Critici Sacri." In the year 1650 a collection of his learned treatises was published in quarto, under the title of "Gregorii Polihuma:" he left behind him three translations from the Greek into Latin, which were published in 1665, by Edward Bythe, esq. in his own name. They are entitled "Palladius de Gentibus Indiæ et Brachmannibus;" "S. Ambrosius de moribus Brachmannorum;" and "Anonymus de Brachmannibus." Biog. Brit.

GREGORY, JAMES, one of the most eminent mathematicians of his age, was born at Aberdeen in the year 1648. He was educated at the grammar school of his native town, and went through the usual course of academical studies in the Marischal college, with credit and reputation. He soon discovered a great turn for mathematical pursuits, and began, at an early age, to make improvements in the science of optics. He published, in 1663, a work entitled "Optica Promota, seu abditæ Radiorum Reflexorum et Refractorum Mytheria, Geometricè enucleata," &c. quarto. This work, which gave an account of the invention of the reflecting telescope, which will be described in the article TELESCOPE, immediately attracted the notice of mathematicians in all parts. About the year 1664 or 1665, Mr. Gregory came to London in order to get his instrument executed by some able hand; but being disappointed in his object, he laid aside his telescope, and went to Italy, where he resided some years. In 1667 he published at Padua "Vera Circuli et Hyperbolæ Quadratura," &c. quarto, in which he announced another of his discoveries, that of an infinitely converging series for the areas of the circle and hyperbola, by which they may be computed to any degree of exactness. He sent home a copy of this work to Mr. John Collins, who communicated it to the Royal Society, where it met with much commendation. Another work, which he published in the following year, was entitled "Geometria Pars Universalis, inserviens Quantitatum Curvarum Transmutationi et Mensuræ," in which he shewed a method of the transmutation of curves. These works procured the author the correspondence of Newton, Huygens, Halley, Wallis, and other most eminent mathematicians. Mr. Gregory was now chosen a member of the Royal Society, and upon his return from his travels he communicated to that learned body an account of the controversy carried on in Italy concerning the motion of the earth. About the year 1668 he was appointed professor of mathematics in the university of St. Andrew's, an office which he held for six years; and in 1674 he was called to Edinburgh, to fill the mathematical chair in that university; this situation he held but little more than a year, when, in the month of October 1675, being employed in shewing the satellites of Jupiter through a telescope, he was struck with a sudden and total blindness, and died in the course of a few days at the early age of thirty-seven. Mr. Gregory possessed an acute and penetrating genius; he was unambitious, and contented with the advantages of his situation as professor, which constituted the only pecuniary reward of his eminent talents. Besides the discoveries already noticed, he invented and demonstrated geometrically, by the

help of an hyperbola, a converging series for making logarithms, which is recommended by Dr. Halley for practical purposes: he sent to Mr. Collins the solution of the famous Keplerian problem by an infinite series: he discovered a method of drawing tangents to curves geometrically, without any previous calculation, and many other things which shew that the most brilliant part of his character was that of his mathematical genius as an inventor. *Biog. Brit.*

GREGORY, DAVID, nephew of the preceding, an able mathematician, was born at Aberdeen in the year 1661. He was the eldest son of Mr. David Gregory who had the singular fortune to see three of his sons all professors of mathematics, at the same time, in three of the universities, *viz.* David at Oxford, his second son James at Edinburgh, and his third son Charles at St. Andrew's. David, the subject of this article, received the early part of his education at his native place, but completed his studies at Edinburgh, where he took his degree of A.M. and so greatly did he distinguish himself in scientific pursuits that he was elected professor of mathematics in that university, when he was only in his twenty-third year. About this period he published from his uncle's papers, with considerable additions of his own, "*Exercitatio Geometrica de Dimensione Figurarum, five Specimen Methodi generalis dimetiendi qualvis Figuræ.*" He soon perceived the excellence of the Newtonian philosophy, and was the first who had the merit of introducing it into the schools by his lectures at Edinburgh. In this city he remained as mathematical professor with distinguished honour and applause till the year 1691, when hearing of Dr. Bernard's intention to resign the Savilian professorship of astronomy at Oxford, he went to London, and was introduced to sir Isaac Newton, who, conceiving highly of his talents, recommended him to be chosen a fellow of the Royal Society. Newton introduced him to the notice of Mr. Flamsteed the astronomer royal, and with their recommendations he was elected Savilian professor, though Mr. Halley was a competitor. Their rivalry laid the foundation of a permanent friendship between these eminent men, and Halley afterwards was the colleague of Gregory, by obtaining the professorship of geometry in the same university. In 1695 he published the substance of his optical lectures which had been read at Edinburgh. This work was entitled "*Catoptrica et Dioptrica Spherica Elementa.*" 8vo. Dr. Gregory, in 1697, gave a demonstration of the Catenarian curve, or that curve which is formed by a chain fastened at each end. The paper on this curve was inserted in the "*Philosophical Transactions.*" and also in a work of much reputation, entitled "*Miscellanea Curiosa.*" as one of the noblest discoveries that had at that time been presented to the Royal Society. The most celebrated work of this learned professor appeared in the year 1701, entitled "*Astronomia Physica et Geometrica Elementa.*" This was written chiefly with the design of explaining sir Isaac Newton's geometry of the central forces, as far as his discoveries in astronomy are built upon it, and to throw the astronomical part of his *Principia* into a new and more intelligible form. It was afterwards translated into English, of which the second edition was published in 1726, in two volumes octavo, entitled "*The Elements of Physical and Geometrical Astronomy, &c.*" This impression was revised and corrected by Mr. Stone. In 1703 our author published a splendid folio edition of the works of Euclid in Greek and Latin. He now began to prepare, in conjunction with Dr. Halley, a new edition of "*Apollonius's Conics.*" but he had not proceeded very far in the undertaking before he was cut off by death in 1710, when only in the forty-ninth year of his age. Besides

the works of Dr. Gregory printed in his lifetime, two others were published after his decease; one "*A short Treatise on the Nature, &c. of Logarithms.*" printed at the end of Dr. Keill's translation of Commandine's *Euclid*; and the other "*A Treatise of Practical Geometry.*" published by Mr. Maclaurin in 1745.

GREGORY, JAMES, brother of the preceding, rose to high eminence as a mathematician. He succeeded his brother in the professorship of mathematics at Edinburgh, which office he held thirty-three years with great reputation, and retiring in 1725, was succeeded by the celebrated Maclaurin. Charles, the other brother, was created professor of mathematics at St. Andrew's, by queen Anne in 1707. This office he held with great credit thirty-two years, when he resigned in favour of his son David, who succeeded him in 1739. He died in 1763. He published a compendium of arithmetic and algebra in Latin, entitled "*Arithmetica et Algebrae Compendium, in Usum Juventutis Academicæ.*" Edin. 1736. *Biog. Brit.*

GREGORY, DR. GEORGE, was a native of Ireland, but at the death of his father, who was a clergyman, and a very elegant scholar, the subject of this article was brought to Liverpool, by his mother, who was a native of Lancashire, where he received the elements of a learned education, which he completed at Edinburgh. He took orders in the church in 1778, and was curate at Liverpool till the year 1782, when he removed to London, and obtained the curacy of Cripplegate. In 1785 he became known as the author of a volume of "*Essays.*" which had an extensive sale, and went through several editions; and in 1789 he published a translation of Lowth's lectures "*On the Sacred Poetry of the Hebrews.*" which was well received by the public. In the year 1804 he was presented, through the interest of lord Sidmouth, by his majesty, to the living of Westham, in Essex; he had previously to this obtained marks of distinction from the bishop of London, which, however, were attended with very small portions of emolument. Dr. Gregory did not live long to enjoy the ease and independence, which his noble friend intended, by the presentation of the living of Westham; he died March 12, 1808. Besides the works already mentioned, he was author of a volume of "*Sermons.*" of the "*Economy of Nature.*" in three vols.; of "*Letters on Literature.*" in two vols.; and was likewise the editor and superintendent of an "*Encyclopedia of Arts and Sciences.*" in two volumes 4to. He was author of a Church History in two vols. 8vo.; and of the life of Chatterton, for whose fate he felt the most sincere commiseration, and divers other works with and without his name. *Monthly Magazine.*

GREGORY, JOHN, an eminent physician, and professor of the practice of physic in the university of Edinburgh, was born in May, 1725. His father was professor of medicine in King's college, Aberdeen; and his grandfather was professor of mathematics, first at St. Andrew's, and afterwards at Edinburgh. Thus Dr. Gregory was the third professor of his family in a lineal descent; and it deserves to be remarked, that, from his great-grandfather, David Gregory, esq. of Kinairly, he was the fifteenth descendant who had held a professorship in a British university: his son now fills the same chair at Edinburgh.

John Gregory began the study of medicine at Aberdeen, and afterwards prosecuted it at Edinburgh, Leyden, and Paris. In the 20th year of his age, he was elected professor of philosophy in King's college, Aberdeen, and had at the same time the degree of doctor of medicine conferred upon him. In the year 1756, upon the death of his brother, Dr. James Gregory, who had succeeded his father as

professor of medicine, he was elected to that chair. But about the year 1765, he left Aberdeen, and went to Edinburgh. Soon after this he was appointed professor of the practice of medicine in the university there, in the room of Dr. Rutherford, who resigned in his favour. The year following, upon the death of Dr. White, he was nominated first physician to his majesty for Scotland. Thus at the time of his death, which took place on the 10th of February, 1773, besides very extensive practice, he enjoyed the highest and most important professional offices, which his native country could afford him.

His first publication, entitled "A comparative view of the Rate and faculties of man with those of the animal world," made its appearance in 1765. This production combines many just and original reflections, with a liberality of sentiment seldom equalled. It went through four editions in two years. In the year 1770, a second work of Dr. Gregory made its appearance; but without his consent, and even contrary to his inclination. This publication was made from a short-hand manuscript taken at his introductory lectures on the practice of physic, and was entitled, "Observations on the duties and offices of a physician, and on the method of prosecuting inquiries in philosophy." Although this publication contained so much valuable matter, that, had it appeared in a much worse dress, it could have done him no discredit, yet he was dissatisfied with its form; and, therefore, he soon after published an edition of it himself, in which his former sentiments were propounded with all the advantages of a correct and elegant style. His last publication, "Elements of the Practice of Physic," was intended as a syllabus to his lectures; but he only lived to complete his account of the diseases usually termed febrile.

He was succeeded in his professorship by the celebrated Dr. Cullen. See Duncan's Med. Commentaries, vol. i. p. 210.

**GREGORY Bay**, in *Geography*, a bay in the straits of Magellan, on the S. coast of Patagonia.

**GREGORY'S Islands**, four small islands in the Mergoi Archipelago. N. lat. 10° 36'.

**GREGORY'S Sound**, a passage between two of the south isles of Arran, on the western coast of Ireland, being one of the passages into Galway bay.

**GREGOUE'**, a town of Africa, in the country of Whidah; four miles S. of Sali.

**GREHWELLER**, a town of France, in the department of Mont Tonnerre; seven miles N. of Creutznach.

**GREIFENBERG**, a town of Lower Carinthia, on the Drave; 25 miles W. of Villaco.

**GREIFFEN**, a lake of Switzerland, in the canton of Zurich, five miles E. of Zurich. It is about six miles long and a mile broad; on one side the shores are flat or gently rising, on the other side are hills richly wooded. The village of Greiffen is agreeably situated on a small promontory, embosomed in a wood.

**GREIFFENBERG**, a town of Silesia, in the principality of Jauer; 32 miles W. of Jauer. N. lat. 50° 59'. E. long. 15° 30'.—Also, a town of Hinder Pomerania; 28 miles N. of Stargard. N. lat. 52° 53'. E. long. 15° 12'.

**GREIFFENBURG**, a town of Germany, in the Ucker Mark of Brandenburg, on the Sernitz; 45 miles N.N.E. of Berlin. N. lat. 53° 8'. E. long. 14° 3'.

**GREIFFENHAGEN**, a town of Hinder Pomerania; 37 miles N. of Culstrin. N. lat. 53° 20'. E. long. 14° 36'.

**GREIFFENSTEIN**, a town of Germany, in the province of Solms Braunfels; seven miles N.N.W. of Braunfels. N. lat. 50° 37'. E. long. 8° 23'.

**GREIFSWALD**, or **GRISWALD**, a seaport town of

Anterior Pomerania, on the river Rik, which is navigable to the Baltic. This town has an university founded in 1456. It was formerly one of the Hanseatic towns; 15 miles S.E. of Stralsund. N. lat. 54° 41'. E. long. 13° 22'.

**GREIFSWALDE ORK**, a small island in the Baltic, off the mouth of the Oder, near the S.E. coast of the island of Usedom. N. lat. 54° 13'. E. long. 12° 3'.

**GREIN**, a town of Austria, on the N. side of the Danube; 62 miles W. of Vienna. N. lat. 48° 15'. E. long. 14° 45'.—Also, a town of the Arabian Irak, on the Euphrates; 36 miles N. of Sura.

**GREITZ**, or **GARWITZ**, a town of Saxony, in the Vogtland, situated on a river which runs to the Elbe. In this town there are some stull manufactures. It contains about 450 houses; 12 miles S.W. of Zwickau. N. lat. 50° 35'. E. long. 12° 10'.

**GREKSAKER**, a town of Sweden, in the province of Westmanland; 48 miles W. of Stroomsholm.

**GREMSA**. See **GRAEMSAY**.

**GRENADA**, **LEWIS DE**, in *Biography*, a Spanish Dominican monk, in the sixteenth century, was born in the year 1504. He was probably intended for a civil life, and educated with that view, but embracing the ecclesiastical profession, he acquired a high character for sanctity and virtue, and was chosen to fill the most honourable posts of his order. He was held in much estimation by the kings of Portugal and Castile, and was made confessor to queen Catherine of Portugal, sister to the emperor Charles V. who was desirous of appointing him to the archbishopric of Braga, an honour which he resolutely declined: he uniformly refused all the offers of ecclesiastical preferment, and devoted his days to the austerities of monastic discipline, and the composition of pious and devotional treatises. He died in the year 1588. His works are theological, consisting of "A Catechism," in four volumes; "A Treatise on Prayer," in two volumes; "Sermons," in the Latin language, in six volumes; and other pious and practical pieces. The greater part of them has been translated from the Spanish and Latin into French by father Girard, and published in two volumes folio, and eight volumes 8vo.

**GRENADA**, in *Geography*, an island in the West Indies, about 20 miles in extent from north to south, and about 10 miles in medial breadth; the extremities gradually contracting northward and southward, and particularly towards the S.W. corner. It was discovered and named by Christopher Columbus in the year 1498; who found it inhabited by a numerous and warlike people, called Charibes or Caribbees, among whom the Spaniards do not seem to have ever attempted to force a settlement. These original inhabitants remained happy and peaceful until the year 1650, when the avarice and ambition of a restless individual devoted them to destruction. This person was Du Parquet, the French governor of Martinico, who putting himself at the head of upwards of 200 hardy ruffians, wantonly attacked and determined to dispossess the unoffending natives. This atrocious act was perpetrated under the mask of religion, and with a mixture of fanaticism and knavery which no honest mind can contemplate without indignation and horror. Notwithstanding the injustice of this invasion, the commanders administered the holy sacrament, in the most solemn manner, to all the soldiers on their embarkation; and again on their landing, Du Parquet, causing a cross to be erected, compelled them to kneel down before it, and join in devout prayer to Almighty God for success to their wicked enterprise. Checked, however, in the progress of this nefarious business by some scruples of

conscience, after he had been hospitably entertained by the natives, he pretended to open a treaty with the chief of the Charaibes for the purchase of the country. Accordingly he gave the natives "some knives and hatchets, and a large quantity of glass beads, besides two bottles of brandy for the chief himself," and thus, says Du Tertre, was the island fairly ceded to the French nation by the natives themselves in lawful purchase! And their future resistance was considered as contumacy and rebellion. Du Parquet, having established a colony in Grenada, and built a fort for its protection, committed the government of the island to a kinsman, named Le Compte, who engaged in a cruel and bloody war with the Charaibes, and being reinforced with 300 men from Martinico, he proceeded to establish and maintain his authority by massacres and murders, the relation of which makes even the reader to tremble. By a series of such enormities, the whole race of Charaibes that possessed Grenada in 1650 was speedily exterminated; and the French, having destroyed all the natives, proceeded in the next place to massacre each other. Du Parquet, in the conduct and execution of those measures by which he had gained possession of Grenada, had so far impaired his fortune, that in 1656 he was under the necessity of transferring it to Count de Cerillac for the sum of 30,000 crowns. This new proprietor appointed a governor, whose tyrannical and rapacious disposition compelled the most respectable of the settlers to quit the country; and those who remained, assuming the administration of justice, brought the governor to a public trial, and ordered him for execution. Cerillac, deriving little advantage from his purchase, conveyed all his rights and interests in Grenada, &c. to the French West Indian company; whose charter being abolished in 1674, the island from that time became vested in the crown of France. The island, as we may naturally suppose, was very imperfectly cultivated during the progress of these revolutions and calamities; and even so late as the year 1700, if Raynal has been rightly informed, it contained no more than 251 whites and 525 blacks, who were employed in three plantations of sugar, and 52 of indigo. By subsequent intercourse of a frangling nature with the Dutch, the circumstances of the planters were somewhat improved, inasmuch that when, in the year 1762, the fortune of war made the English masters of this and the other Charaib islands, Grenada and the Grenadines are said to have yielded annually, in clayed and muscovado sugar, a quantity equal to about 11,000 hogheads of muscovado of 15 cwt each, and about 27,000 lbs. of indigo. Grenada, having surrendered on capitulation in February 1762, was finally ceded, together with its dependencies, to Great Britain by the definitive treaty of peace at Paris on the 12th of February 1763. The chief stipulations of this treaty were as follow: 1<sup>st</sup>. That as they would become by their surrender subjects of Great Britain, they should enjoy their property and privileges, and pay taxes, in like manner as those of his majesty's subjects of the other British Leeward islands. 2<sup>dly</sup>. With respect to religion, they were put on the same footing as the inhabitants of Canada, *i. e.* Liberty was given them to exercise it according to the rites of the Romish church, as far as the laws of Great Britain permitted. 3<sup>dly</sup>. Such of the inhabitants of Grenada as chose to quit the island, should have liberty so to do, and 18 months should be allowed them to dispose of their effects. The island and its dependencies being thus become a British colony, two proclamations were issued, and general Mowille was appointed governor. The crown, conceiving itself entitled by the terms of the capitulation to the duty of  $4\frac{1}{2}$  per cent. upon all produce exported from the newly ceded islands, ordered such duty to

be levied in Grenada, in lieu of all customs and duties formerly paid to the French king. This order occasioned a great constitutional question, which after much agitation was referred to a solemn adjudication before the judges of the court of king's bench in England. The case was elaborately argued in Westminster hall, and lord chief justice Mansfield, in 1774, pronounced judgment against the crown: and therefore the duty in question was abolished, not only in Grenada, but also in the ceded islands of Dominica, St. Vincent, and Tobago.

The first assembly of Grenada met in 1765; and in 1768 the governor received instructions from the crown to admit two of the Roman Catholic inhabitants into the council, and to declare others to be eligible into the assembly on taking the oaths of allegiance and supremacy. These instructions, and the measures which followed them, were productive of great commotions and party divisions in the colony. The king, however, refused to revoke his instructions; upon which the most zealous of the Protestant members of the assembly declined attendance, so that it was but seldom that a house could be formed. In this state of faction and perplexity the island continued until its recapture by the French under the count D'Estaing, in 1779. By the general pacification which took place in January 1783, Grenada and the Grenadines were restored to Great Britain.

Grenada contains about 80,000 acres of land; of which the quantity actually cultivated has never exceeded 50,000 acres. The face of the country is mountainous, but not inaccessible in any part, and it abounds with springs and rivulets. To the north and the east the soil is a brick mould; on the west side it is a rich black mould on a sub-stratum of yellow clay. To the south the land is in general poor, and of a reddish hue, which extends over a considerable part of the interior country. On the whole, however, Grenada appears to be in a high degree fertile, and by the variety, as well as excellence of its returns, seems adapted to every tropical production. The exports of the year 1776, from Grenada and its dependencies, were 14,012,157 pounds of muscovado, and 9,273,607 pounds of clayed sugar; 818,700 gallons of rum; 1,827,166 pounds of coffee; 457,719 pounds of cacao; 91,943 pounds of cotton; 27,638 pounds of indigo, and some smaller articles: the whole of which, on a moderate computation, could not be worth less, at the ports of shipping, than 600,000 sterling, excluding freight, duties, insurance, and other charges. The sugar was the produce of 106 plantations, wrought by 18,293 negroes, which is rather more than one hoghead of muscovado sugar, of 16 cwt from the labour of each negro; a return, says Mr B Edwards, equalled by no other British island in the West Indies, St. Christopher's excepted. The exports of 1787 were 175,548 cwt. 9 lbs. of sugar; 670,390 gallons of rum; 4,300 gallons of molasses; 8,812 cwt. 2 qrs. 4 lbs. of coffee; 2,716 cwt. 3 qrs. 18 lbs. of cacao; 2,062,427 lbs. of cotton; 2,810 lbs. of indigo, and miscellaneous articles; such as hides, dyeing wood, &c. to the amount in value of 64,545*l.* or 8*d.*; and the total value of all, according to the current prices in London, 614,908*l.* 9*s.* 3*d.*

This island is divided into six parishes, *viz.* St George, St. David, St. Andrew, St. Patrick, St. Mark, and St. John; and its chief dependence, Carriacou, forms a seventh parish. Since the restoration of Grenada to Great Britain in 1783, an island law has been obtained for the establishment of a Protestant clergy. This act, which passed in 1784, provided stipends of 33*l.* currency, and 6*l.* for maintenance *per annum.* for five clergymen, *viz.* one for the town and

and parish of St. George, three for the other five out-parishes of Grenada, and one for Carriacou. Besides these stipends, there are valuable glebe lands formerly appropriated to the Roman Catholic clergy, when that was the established religion of Grenada, which became vested in his majesty as public lands on the restoration of the island to the British government, and which, it is said, have been applied by the colonial legislature, with the consent of the crown, to the further support of the Protestant church, with some reserve for the tolerated Romish clergy. The capital of Grenada, soon after the cession of the country to Great Britain by the peace of Paris, is called *St. George*, which see. The other towns in Grenada are, properly speaking, inconsiderable villages or hamlets, which are generally situated at the bays or shipping places in the several out-parishes. The parish town of Carriacou is called Hillborough. Grenada has two ports of entry, with separate establishments, and distinct revenue officers, independent of each other; one at St. George, and one at Grenville bay, a town and harbour on the east, or windward side of the island. The whole population of Grenada and the Grenadines has decreased considerably since these islands first came into possession of the English. In the year 1771, the number of white inhabitants was somewhat more than 1600; in 1777, they had decreased to 1300, and at a later period they were supposed not to exceed 1000, of which about two-thirds are men able to bear arms, and incorporated into five regiments of militia, including a company of free blacks or mulattoes attached to each. There are likewise about 500 regular troops from Great Britain, which are supported on the British establishment. Besides the regular troops sent from Great Britain for the protection of Grenada, there are in its garrison three companies of king's negroes, which came from America, where they served in three capacities, as pioneers, artificers, and light dragoons. In Grenada they form a company of each, and are commanded by a lieutenant of the regulars, having the rank of captain. The negro slaves have also decreased. In 1779 they were stated at 35,000, of which 5000 were in Carriacou and the smaller islands. In 1785 they amounted to no more than 23,926 in the whole. The free people of colour amounted in 1787 to 1,115. To prevent the too great increase of persons of this class, every manumission is, by an act of the island, charged with a fine of 100*l.* currency, payable into the public treasury. The evidence of these people, whether born free or manumitted, is received in the courts of this island, on producing proof of their freedom; and they are tried on criminal charges in the same manner as whites. They are also allowed to possess and enjoy lands to any amount, provided they are native-born subjects or capitulants, and not aliens. The governor is, by virtue of his office, chancellor, ordinary, and vice-admiral; and presides solely in the courts of chancery and ordinary, as in Jamaica. His salary is 3,200*l.* currency *per annum*, which is raised by a poll-tax on all slaves; but in all cases of absence beyond twelve months, the salary ceases and determines. N. B. The currency of Grenada, or rate of exchange, is commonly 6*5l.* *per cent.* worse than sterling. The council of Grenada consists of 12 members, and the assembly of 26. A free-hold, or life-estate of 50 acres, is a qualification to sit as representative for the parishes, and a free-hold, or life-estate, in 50*l.* house-rent in St. George, qualifies a representative for the town. An estate of ten acres in fee, or for life, or a rent of 10*l.* in any of the out-towns, gives a vote for the representatives of each parish respectively; and a rent of 20*l.* *per annum*, issuing out of any freehold or life-estate in the town of St. George, gives a vote for a representative of the town. The law-

courts in Grenada, besides those of chancery and ordinary are the court of grand sessions of the peace held twice a year, *viz.* in March and September; the court of common-pleas, consisting of one chief and four assistant justices, whose commissions are during pleasure, the chief justice being usually appointed in England, with a salary of 600*l.* *per annum*, and the others being commonly appointed by the governor without any salary; the court of exchequer, lately grown into disuse; the court of admiralty for the trial of all prize-causes of capture from enemies in war, and of revenue-seizures in peace or war, having one judge of admiralty and one surrogate; and a court of error, composed of the governor and council, for trying all appeals of error from the court of common-pleas. The common and statutes-laws of England are considered as extending to Grenada in all applicable cases, not provided for by the laws of the island. N. lat. 12 10'. W. long. 61 30'. Edwards's *Hist.* of the West Indies, vol. i.

GRENADA, or *Granada*. See GRANADA.

GRENADA. See GRANADA.

GRENADE, a town of France, in the department of the Landes, and chief place of a canton, in the district of Mont-de-Marsan; seven miles E. of St. Séver. The place contains 1330, and the canton 7563 inhabitants, on a territory of 195 kilometres, in eleven communes.—Also, a town of France, in the department of the Upper Garonne, and chief place of a canton, in the district of Toulouse; 12 miles N. N. W. of Toulouse. The place contains 3500, and the canton 9142 inhabitants, on a territory of 232½ kilometres, in 13 communes.

GRENADIER. See GRANADIER.

GRENADIER, in *Ornithology*. See LOMIA *Orix*.

GRENADIN. See FRINGILLA *Granatina*.

GRENADINES, or GRENADILLAS, in *Geography*, a cluster of islands in the West Indies, amounting in number to more than 20, situated between Grenada and St. Vincent, and producing cotton, coffee, indigo, and sugar. Carriacou is the principal. These islands formerly appertained to the government of Grenada; but by an arrangement of the British administration, a line of division passes in an east and west direction, between Carriacou and Union island. The former of these, and some smaller islands south of it, are all that are now comprized in the Grenada government; Union island, with all the little islands adjoining, to the north, being annexed to the government of St. Vincent. See CARRIACOU and RONDE.

GRENAILLE, a name given by the French writers to a preparation of copper, which the Chinese use as a red colour in some of their finest china, particularly for that colour which is called *oil-red*, or *red in oil*. The china-ware coloured with this is very dear. The manner in which they procure the preparation is thus: they have in China no such thing as silver-coined money, but they use in commerce bars or masses of silver; these they pay and receive in large bargains; and among a nation so full of fraud as the Chinese, it is no wonder that these are often adulterated with too great an alloy of copper. They put, however, in this state in the common payments. There are some occasions, however, such as the paying of the taxes and contributions, on which they must have their silver pure and fine; on this occasion they have recourse to certain people, whose sole business it is to refine the silver, and separate it from the copper and the lead it contains. This they do in furnaces made for the purpose, and with very convenient vessels. While the copper is in fusion, they take a small brush, and dip the end of it into water; then striking the handle of the brush, they sprinkle the water by degrees

upon the melted copper; a sort of pellicle forms itself by this means on the surface of the matter, which they take off while hot with pincers of iron, and immediately throwing it into a large vessel of cold water, it forms that red powder, which is called the grenaille; they repeat the operation every time they in this manner separate the copper; and this furnishes them with as much of the grenaille as they have occasion for in their china works. Observations sur les Coûtumes de l'Asie, p. 309.

**GRENAHEN**, in *Geography*, a town of Switzerland, in the Valais; 25 miles E. of Sion.

**GREMAT**, in *Ornithology*. See **TROCHILUS Auralus**.

**GRENIER**, in *Geography*, mountains of Hindoostan, in the country of Guzerat, near Junagur.

**GRENNA**, a town of Sweden, in the province of Smaland; 10 miles N.N.E. of Jonkioping.

**GRENOBLE**, an ancient, large, and well-built city of France, and capital of the department of Isere, situated in a marshy but fruitful plain, at the foot of a hill, near the conflux of the river Isere. Before the revolution it was the capital of Dauphiny, the see of a bishop, and the seat of a parliament. It was the scene of many cruelties in the religious wars, A.D. 1562. It is divided by the river Here into two unequal parts, the largest of which is regularly built. Its manufactures are cloth, hats, gloves, &c. The number of its inhabitants is 23,500 in 3 cantons, on a territory of 265 kilometres, in 26 communes. To the north are the ruins of a citadel, on an eminence, which commands an agreeable prospect of the town, the banks of the Isere, and several fertile vallies. In a rugged valley, watered by the rapid Drac, about 5 leagues S. of Grenoble, are the mineral springs of La Motte, highly esteemed as a remedy for fluxes and all disorders of the stomach, but little used on account of the difficult access to them. Four leagues N. of Grenoble is Le Grand Chartreuse, a famous Carthusian monastery, founded A.D. 1086, consisting of an excellent library, and many apartments, on an eminence environed by rugged precipices of difficult access. N. lat. 45° 11' 59". E. long. 5 43' 10".

**GRENOUILLES, LES**, a cluster of rocks in the West Indian ocean, about 36 miles S.E. from point Morand, in the island of Jamaica. N. lat. 17° 32'. E. long. 76 32'.

**GRENVILLE**, a town of Nova Scotia. See **GRANVILLE**.

**GRENVILLE**, a county in Upper Canada, bounded on the E. by the county of Dundas, on the S. by the river St. Lawrence, and on the W. by the township of Elizabeth town, running N. 24 W. till it intersects the Ottawa or Grawl river, and thence descending that river until it meets the north and westernmost boundary of the county of Dundas. This county comprehends all the lands near to it in the river St. Lawrence.

**GRENVILLE'S Canal**, a channel of the N. Pacific ocean, which separates Pitt's Archipelago from the coast of New Cornwall.

**GRENZHAUSEN**, a town of Germany, in the county of Wied; 5 miles N.E. of Coblenz.

**GREPPEN**, a town of Switzerland, in the canton of Lucerne; 5 miles E. of Lucerne.

**GRES, CAPE AU**, a promontory on the E. side of the Mississippi, in the N.W. territory, 3 leagues above the Illinois river, and the tract of country so called extends 5 leagues up that river.

**GRESHAM, Sir THOMAS**, in *Biography*, an eminent London merchant, son of sir Richard Gresham, who was

raised to the high office of lord mayor of the city of London, was born in 1519. He received an academical education at Cambridge, but being designed to follow the commercial business of the family, he was bound apprentice to his uncle sir John Gresham, and thus became a member of the Mercers' company. His father was agent of the king's money concerns at Antwerp, and Thomas expected to be his successor in this business, but the preference was given to another person, by whose mismanagement they were brought into a deplorable condition. Recourse was now had to the subject of this article, who was sent over in 1532 by the regency in the minority of Edward VI., in order to retrieve them. In this affair he exerted so much talent, that in two years he was able to pay off the whole of a loan bearing enormous interest, and raised the king's credit to the most respectable rank. At the accession of Elizabeth, he was for a time deprived of his office, but it was restored to him again, and he continued in it as long as he lived. He also received at the hands of his sovereign the honour of knighthood. He transacted many important pecuniary negotiations of that long and glorious reign, and was a most spirited promoter of the infant manufactures of the kingdom, those of small wares in particular being established chiefly through his means. His own property, derived by inheritance, with that acquired by his industry and talents, made him the richest subject in the metropolis, and he made use of his wealth to noble and extensively beneficial purposes. In 1564 he had the misfortune to lose his only son, and he fell upon the means of diverting his grief on this melancholy occasion by public undertakings. The first design of building an exchange for merchants, in imitation of that of Antwerp, was entertained by his father. Sir Thomas carried the plan into effect, and completed the noble building in three years. (See *ROYAL Exchange*.) When the troubles in the Low Countries interrupted the accustomed loans to the crown from Antwerp, sir Thomas advised the minister to apply to the merchants of his own country, and this may be considered as the commencement of the immense advances since made to the crown from the same body. Sir Thomas Gresham next determined to bestow a part of his wealth in founding a college for the sciences in his native city. The principal people in the university of Cambridge endeavoured to dissuade him from thus establishing a rival institution; but his determination was fixed. He devised by will his house in Bishopsgate-street for the purpose of being converted into habitations and lecture-rooms for seven professors, or lecturers on the seven liberal sciences, who were each of them to receive a salary out of the revenues of the Royal Exchange. These lectures are still given in apartments in the Royal Exchange, whenever there are a sufficient number of auditors assembled to call for the exertions of the lecturer. The subjects of the lectures are *divinity, law, physic, astronomy, geometry, music, and rhetoric*. Sir Thomas endowed many public charities. He died suddenly in his own house in the year 1579, and was buried in a sumptuous manner in the church of St. Helens, Bishopsgate-street. He had expended large sums of money in erecting corn, oil, and paper-mills upon the stream of the Brent, near his favourite villa at Otterly-park. Biog. Brit.

**GRESHAM College**. See **COLLEGE**.

**GRESHOLM**, in *Geography*, a small island of Denmark, in the Categat; 4 miles N.E. of Lessor.

**GRESI**, a town of Turkish Armenia; 28 miles S.E. of Rizeh.

**GRESLEY'S CANAL**, is an inland navigation in Staffordshire, near Newcastle-under-line, made in pursuance of an act of 15 Geo. III. To the account given in our article

CANAL



CANAL we have here only to add, that in 1805 the Nantwich and Newcastle rail-way was proposed, to connect with this canal, at Dale's pool.

GRESLING, in *Ichthyology*, a name given by the Germans to the *gobius fluviatilis*, or common gudgeon, which is very frequent in their smaller rivers.

GRÜSNICH, in *Biography*, a modern German composer of the Italian school, who has composed several successful operas in Italy, and whose capital *bravura* airs were frequently sung in England by madame Mara, for whose abilities of execution we believe they were originally composed.

GRESSEN, in *Geography*, a town of Samogitia; 20 miles N.N.E. of Miedniki.

GRESSET, JOHN BAPTIST LEWIS, in *Biography*, born at Amiens in the year 1709, was educated among the Jesuits, and from this retreat he sent forth some poems, which possessed all the ease and delicate pleasantry that could have been looked for from the pen of a man of the world. These were entitled "Ver Vert," a very pleasing tale; his epistles of "La Chartreuse;" "Les Ombres," and many others. His reputation as a poet was the cause of his quitting the society, and fixing his residence in the metropolis. He now tried his powers in dramatic composition; in tragedy he had very little success, but his comedies were better received; and that entitled "Mechant," represented in 1747, raised him to the first rank of writers in this class. It was regarded as a masterpiece in that species of comedy which paints manners with truth and force, without being highly comic. Gresset was admitted a member of the French academy in the year 1748. He grew weary of a literary life, seemed to doubt of the propriety of theatrical exhibitions, and soon after re-

nounced the stage, by a letter, in which he displayed the dangers attending public spectacles. He returned to Amiens, where he obtained a post under government, married a lady with a good fortune, and passed the remainder of his life in a manner which acquired him the esteem and respect of his fellow citizens. In 1775 he revisited the metropolis, and had the honour, as director of the French academy, to compliment Lewis XVI. and his queen on their accession to the throne. His discourse on this occasion, which was printed, was a severe satire on the vices and follies of the metropolis. He died in June 1777, having received, some time previously to this, letters of nobility, and having been likewise appointed historiographer of the order of St. Lazare. Gresset is placed between Chaulieu and Voltaire for the graces of light poetry; he is perhaps the first at the theatre for elegance of versification in comedy, and his morals were as pure as his style. Gen. Biog.

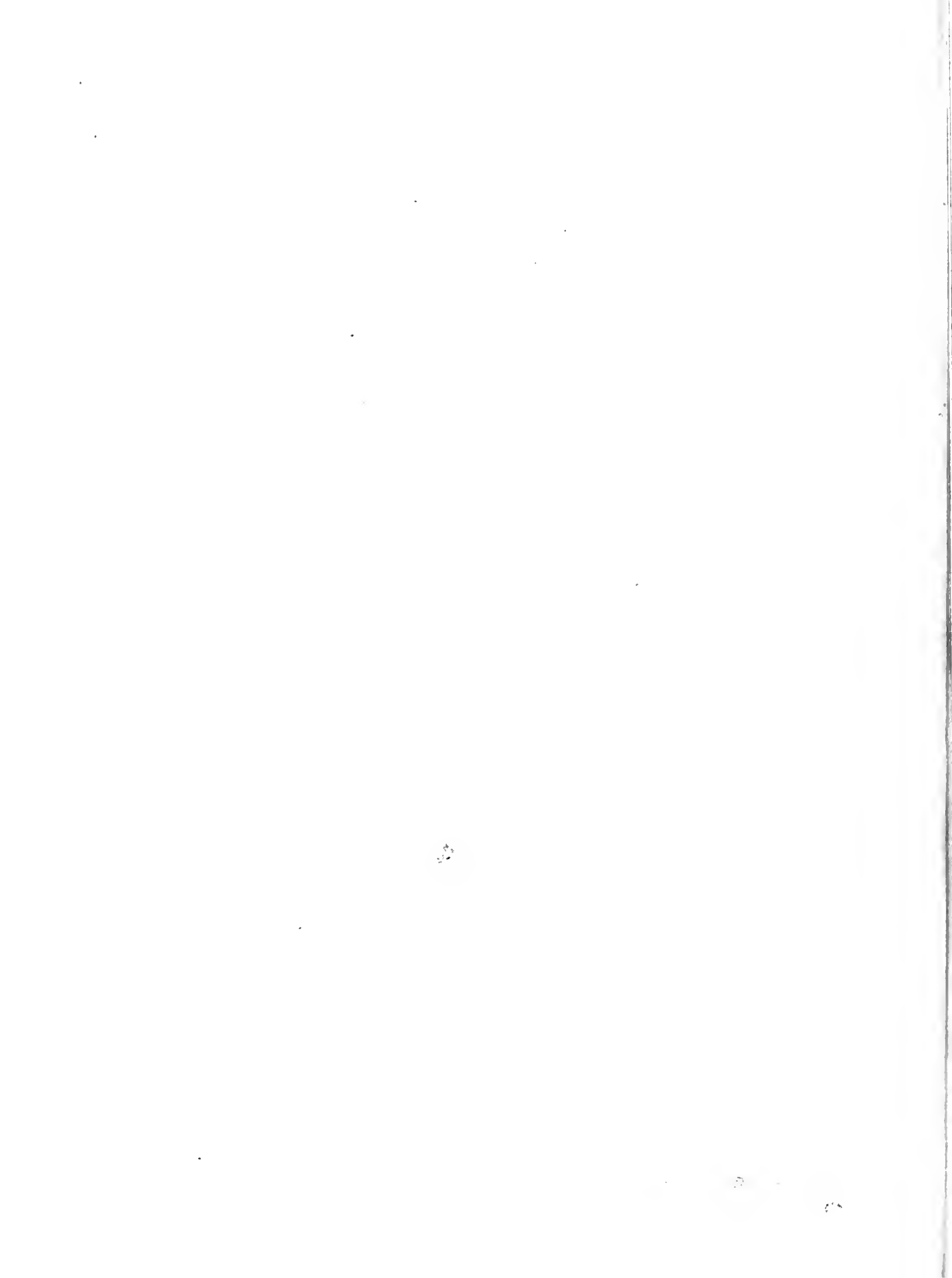
GRESSIN, in *Geography*, a town of Hindér Pomerania; 14 miles S.E. of Belgard.

GRESTEN, a town of Austria; 9 miles N.E. of Bavaria Waidhoven.

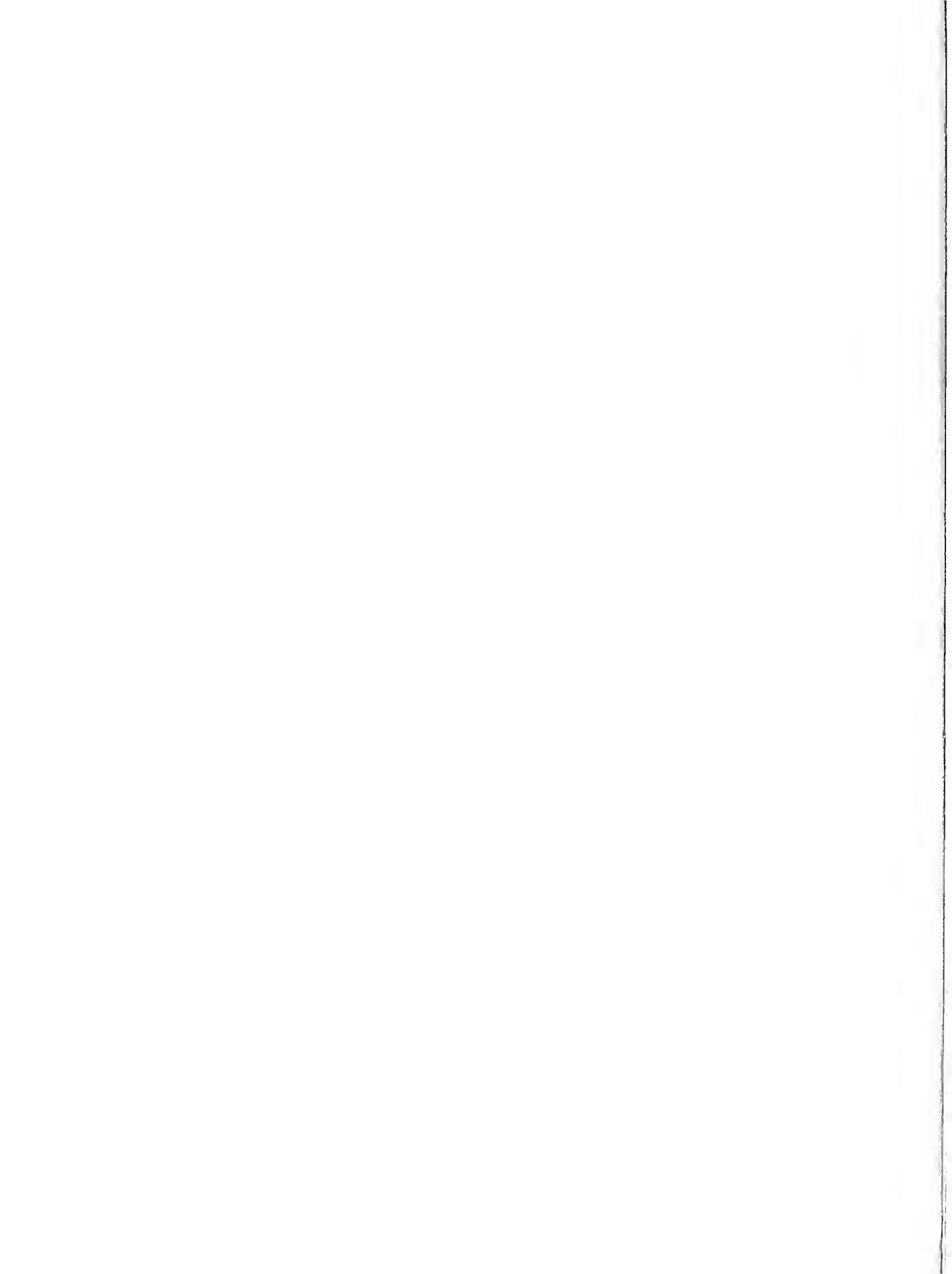
GRETA, a river of England, which rises in the N.W. part of Yorkshire, and runs into the Tees, about 4 miles below Bernard's Castle, in Durham.

GRETNA GREEN, a mean village of Scotland, in the shire of Dumfries, 8 miles from Carlisle, and 82 from Edinburgh, at the S.E. extremity of the county, near the W. bank of the Sark, and bottom of Solway firth; famous for the clandestine marriage of parties from England, celebrated by persons who have no right to marry, or to exercise any part of the clerical function; because it is out of the jurisdiction of the marriage act.

END OF VOL. XVI.









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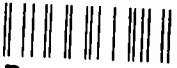
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